DOCUMENT RESUME

ED 147 135 SE 023 313

TITLE	National Environmental/Energy Workforce Assessment for Massachusetts.
INSTITUTION	National Field Research Center Inc., Iowa City, Iowa.
SPONS AGENCY	Environmental Protection Agency, Washington, D. C.
PUB DATE	77
GRANT	EPA-T-900591010
NOTE	135p.; For related documents, see SE 023 292-360; Contains occasional colored pages
EDRS PRICE	MF-$0.83 HC-$7.35 Plus Postage.
DESCRIPTORS	Air Pollution Control; *Career Opportunities; *Educational Programs; Energy; Environment; *Manpower Needs; Pesticides; *Pollution; Post Secondary Education; Radiation; *State Legislation; Water Pollution Control
IDENTIFIERS	*Massachusetts; Noise; Solid Wastes

ABSTRACT

This report presents existing workforce levels, training programs and career potentials and develops staffing level projections (1976-1982) based on available information for the State of Massachusetts. The study concerns itself with the environmental pollution control areas of air, noise, potable water, pesticides, radiation, solid waste, wastewater, and energy. The format includes workforce profiles, projections, growth and career options for each of the areas investigated. Additional sections of the report outline state legislation and selected post secondary institutions with formal Environmental/Energy programs. A state profile and summary is included for cross-reference. The selected bibliography is appended in the Region I report. This document is one in a series of 69 which presents information for each of the states, Washington, D.C., Puerto Rico, and the Virgin Islands, and national and regional summaries. (CS)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED147135

A National Environmental/Energy Workforce Assessment

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Conducted by:

National Field Research Center, Inc.

P.O. Box 287

Iowa City, Iowa 52240

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Donald Cook

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

SE 023 313

NATIONAL ENVIRONMENTAL/ENERGY

WORKFORCE ASSESSMENT

for

MASSACHUSETTS

Conducted by:

NATIONAL FIELD RESEARCH CENTER, INC

Under Grant from:

UNITED STATES

ENVIRONMENTAL PROTECTION AGENCY

Grant #T900591010

1977

This document has been reviewed by the Environmental Protection Agency and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

National
Field
Research
Center, Inc.

Box 287 Iowa City, Iowa 52240 (319) 351-8789

INTRODUCTORY NOTE

The National Environmental/Energy Workforce Assessment was conducted by National Field Research Center, Inc. with main offices in Iowa City, Iowa. The following personnel have had primary responsibility for the Assessment and project report.

IOWA CITY, IOWA
- Dr. Darold E. Albright, President
- Paul E. Bridges, Executive Director
- Dr. Richard L. Benesh, Project Director
- Judith J. Gordon
- Alan M. Stowell
- Anita M. Stowell
- Mary Kay (Edge) Wade

ATLANTA, GEORGIA
- Elizabeth G. Nielsen, Regional Director
- Robert Oxberger

DENVER, COLORADO
- Nancy C. Dillenberg, Regional Director

SEATTLE, WASHINGTON
- Steven Silva, Regional Director

WASHINGTON, D.C.
- Frank E. Smith, Project Coordinator
- Lloyd B. Chaisson, Assistant Project Coordinator
- Jack F. Seum

Additional research and clerical assistance was provided by Frederick M. Wall, Maxine Wolfe, Margaret Fehn, Sandra Hogsed, Karen Kirchoff, Sharon Leiker, Marilyn Low, Mary McCormac, and Joan Urquhart.

FIELD OFFICES

ATLANTA
2700 Cumberland Pkwy
Suite 150
Atlanta, GA 30339
(404) 433-2644

DENVER
2800 S. Parker Rd.
Suite 160, No. 6
Denver, CO 80232
(303) 751-4982

SEATTLE
927 United Pacific Bldg.
1000 2nd Ave.
Seattle, WA 98101
(206) 623-9170

WASHINGTON, D.C.
1522 K Street, N.W.
Suite 600
Washington, D.C. 20005
(202) 223-9136

TABLE OF CONTENTS

	Page
ILLUSTRATIONS	iii
ACKNOWLEDGEMENT	v
PREFACE	viii
FOREWORD	ix
STATE SUMMARY	1
COMMONWEALTH PROFILE	14
POLLUTION CONTROL AND ABATEMENT AGENCIES	16
POLLUTION CONTROL AND ABATEMENT PROGRAMS	20
I. Air	21
II. Noise	33
III. Pesticides	39
IV. Potable Water	45
V. Radiation	58
VI. Solid Waste	67
VII. Wastewater	81
VIII. Energy	94
SELECTED POST SECONDARY INSTITUTIONS WITH FORMAL ENVIRONMENTAL/ENERGY PROGRAMS	100
STATE LEGISLATION	107

NOTE: The Selected Bibliography is appended to each Regional Report.

ILLUSTRATIONS

Figure		Page
1	Massachusetts Air Pollution Control Program	24
2	Commonwealth of Massachusetts, Classification of Water Supply Facilities	51
3	Commonwealth of Massachusetts, Operator Education and Experience Qualifications	52
4	Commonwealth of Massachusetts, Water Supply Facilities in Massachusetts	53
5	Commonwealth of Massachusetts, Select Water Supply Training Programs in Massachusetts	55
6	Commonwealth of Massachusetts, Massachusetts Nuclear Generating Units in Operation, under Construction, or Proposed	59
7	Proposed Resource Recovery Plant Locations in Massachusetts	70
8	Commonwealth of Massachusetts, Resource Recovery Facility Implementation Schedule	71
9	Commonwealth of Massachusetts, Areas of Career Potential for Resource Recovery Related O & M Employment	78
10	Commonwealth of Massachusetts, Construction Grants Program Status Funding as of January 1, 1977	82
11	Massachusetts Wastewater Program	84
12	Selected Wastewater Training Programs in Massachusetts	88
13	Oil Use and Potential Savings, Massachusetts	98
14	BEO Organization	99

Table		Page
I	Commonwealth of Massachusetts, Significant Private Sector Air Pollution Control Efforts	27
II	Commonwealth of Massachusetts, Municipal Noise Ordinances - 1976*	36
III	Executive Office of Environmental Affairs, Pesticide Branch, Current (1976) Staffing Level (est.)	40
IV	Executive Office of Environmental Affairs, Pesticides Branch, Proposed Staffing Level	41
V	Commonwealth of Massachusetts, Proposed Certification, Private Sector Pesticide Workforce	42
VI	Commonwealth of Massachusetts, Status of Commercial and Private Applicator Training	43
VII	Commonwealth of Massachusetts, SDWA Implementation Funding 1977	45
VIII	Executive Office of Environmental Affairs, Department of Environmental Quality Engineering, Water Supply Program, Current (1976) Staffing Level	48
IX	Commonwealth of Massachusetts, Division of Water Supply, Cost and Workforce Estimates for SDWA Implementation, Fiscal Years 1977 and 1978	49
X	Massachusetts Department of Public Health, Radiation Protection Program, Current (1976) Staffing Level	60
XI	Massachusetts Executive Office of Environmental Affairs, Department of Environmental Management, Bureau of Solid Waste Disposal, Current (1976) Staffing Level	73
XII	Massachusetts Executive Office of Environmental Affairs, Department of Environmental Management, Bureau of Solid Waste Disposal, Workforce Projections	76
XIII	Massachusetts Executive Office of Environmental Affairs, Department of Environmental Quality Engineering, Division of Water Pollution Control, Current (1976) Staffing Level	85

Table		Page
XIV	Commonwealth of Massachusetts, Wastewater Operator Training Summaries	90
XV	Commonwealth of Massachusetts, Wastewater Operator Training Summaries	91

ACKNOWLEDGEMENT

Valuable support and assistance for this report was provided by the Department of Environmental Quality Engineering, the Department of Public Health and the Department of Environmental Management. Appreciation is extended to Dr. Evelyn Murphy of the Executive Office of Environmental Affairs for contributing a broad overview of the State of Massachusetts' environmental regulatory programs.

Contributing information concerning the state's air pollution control program was Dr. Antony Cortese of the Department of Environmental Quality Engineering's Division of Air and Hazardous Materials. Noise control information was provided by Mr. Al Comproni and Mr. Don Squire of the Department's Division of Air and Hazardous Materials. Assistance was also supplied by Dr. Lewis Wells of the Pesticide Board for an overview of the pesticides regulatory program and training activities. Mr. George J. Coogan and Mr. Bob McCracken of the Division of Water Supply described the state's efforts to comply with the Federal Safe Drinking Water Act. Of equal importance was the assistance of Mr. Thomas McMahon of the Division of Water Pollution Control who supplied information on wastewater pollution activities and described the current status of the construction grant program.

Within the Massachusetts Department of Public Health, Mr. Gerald S. Parker described the state's radiation control program's operating status. Finally, appreciation is extended to Mr. Alden Cousins of the Department of Environmental Management's Division of Solid Waste Disposal, who explained how Massachusetts handles solid waste and what future initiatives may

result from the enactment of the new Federal Resource Conservation and Recovery Act.

PREFACE

This study provides information on existing workforce levels, training programs, and career potentials and develops workforce projections (1976-1982) for the environmental pollution control fields of air, noise, pesticides, potable water, radiation, solid waste, wastewater and energy conservation/conversion in the Commonwealth of Massachusetts. The profiles and projections contained in this report were based upon available information obtained through various state agencies. The information and data presented in this study were obtained through extensive personal interviews with professionals working in the respective fields. The personal interviews were supplemented with information collected through telephone surveys and research.

This study was conducted under the direction of the United States Environmental Protection Agency by National Field Research Center, Inc., located in Iowa City, Iowa.

FOREWORD

The materials contained in this report include information and data collected for eight individual pollution control inventories conducted for Massachusetts. The format includes workforce profiles, projections, and career potential for the areas investigated. Projections were necessarily based on best professional estimates obtained through available information. The pollution control areas considered by this study are as follows:

Air

Noise

Pesticides

Potable Water

Radiation

Solid Waste

Wastewater

Energy

National Environmental Energy
Workforce Assessment

Phase I

MASSACHUSETTS

State Summary

I. AIR

The Commonwealth of Massachusetts' air pollution control program is administered by the Air and Hazardous Materials Division of the Department of Environmental Quality Engineering (DEQE), Executive Office of Environmental Affairs. It is estimated that about 100 persons were employed statewide in air pollution abatement and control functions.

The air program of the Division of Air and Hazardous Materials is presently undergoing a reorganization and reappraisal of program objectives and strategies. Once reorganization is completed, program officials anticipate a redirection of program priorities.

Tentative workforce projections through 1981 suggest that the program will experience a 10 percent growth rate which would result in a staffing of 10 to 12 additional positions. It is anticipated that during 1978, legislation will be introduced which, if enacted, would augment air program activities, resulting in the addition of these positions.

Considerable career potential for skilled automobile emissions control technicians is likely to develop if the state implements an inspection and maintenance (I&M) program as necessitated by its most recent transportation control plan. If the program is initiated, a cadre of trained inspectors will be needed throughout the state to maintain the emission control systems of all registered vehicles.

II. NOISE

Noise control in Massachusetts is administered by the Air and Hazardous Materials Division of the Department of Environmental Quality Engineering (DEQE). Currently within the state there is no legislative mandate for the abatement and control of noise pollution; however, a loose interpretation of existing air laws has enabled the state to develop limited noise regulations. The Registry of Motor Vehicles is responsible for motor vehicle sound emissions; however, only regulation for off-road recreational vehicles and snowmobiles have been promulgated.

About 1.2 person-years are devoted to noise at DEQE's headquarters level. Within the Department's four regional field offices, about 3.5 person years are devoted to noise control and abatement, making DEQE's entire effort about 4.7. At the municipal level, Boston appears to be the only municipality in the state which has one full-time professional engineer regulating excessive sound levels through local ordinance.

Due to the lack of any projected increases in the state noise program staffing levels, the potential for careers in noise control over the next five years will be limited, at best, until either EPA or Massachusetts decides to bolster the program with additional funding. Careers in the private sector will also most likely be a function of federal and state requirements and standards, which are not anticipated to develop in any areas beyond new product noise regulations, at least not within the next five years.

III. PESTICIDES

In Massachusetts, the Pesticide Branch, under the Executive Office of Environmental Affairs, is responsible for all uses and applications of pesticides within the state. The Department of Public Health is responsible for registration of pesticides distributed within the state. Currently, the pesticide law in Massachusetts does not meet the federal requirements promulgated under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). The state's laws now call for certification of applicators who apply pesticides on land only, which does not satisfy the other types of applicator certification mandated by FIFRA.

Presently, there are four individuals charged with implementing and developing the state's pesticide use program. Workforce projections for the Pesticide Branch of the Division of Environmental Quality Engineering are not determinable as federally acceptable state pesticide laws are not in effect, nor has a state plan been ratified. However, basic training for private and commercial applicators is proceeding on a provisional basis. If a compromise is reached and a state plan for Massachusetts is ratified by the state legislature, then it appears that the greatest potential for career employment with the Pesticide Branch will be for field inspectors.

The only significant workforce increases in pesticide-related careers will occur in the private sector, as it is expected that several hundred applicators will require certification on a per annum basis after the initial bulk of certification is completed.

IV. POTABLE WATER

The Massachusetts water supply program is located in the Department of Environmental Quality Engineering (DEQE) of the Executive Office of Environmental Affairs. It is responsible for testing all water supply systems in the state, for approving all new water systems, resources, and well sites. Currently, the state is developing a program which will satisfy all requirements of the federal Safe Drinking Water Act of 1974 (SDWA). At this time, it is anticipated that Massachusetts will assume primacy under SDWA. Plans and regulations have been submitted to the state legislature for ratification.

Massachusetts state law requires that any individual or local government which sells or distributes water must have a certified operator/distributor present and accountable. Additionally, every city and town must have a certified operator regardless of whether or not the municipal supply requires treatment. Currently within the state there are about 1,200 certified operators/distributors.

The water supply program of Massachusetts is totally dependent on federal funding for any future workforce growth as the program has been ordered by the Governor to effect a ten percent decrease in total state operating expenses over the next four years. Workforce growth/decline is unknown as a result. Standards promulgated under the Safe Drinking Water Act of 1974 are likely to increase the need for technical skills necessary for operating compliance.

V. RADIATION

The Massachusetts radiation control program is located within the State Department of Health and is responsible for monitoring and control of the uses of ionizing and non-ionizing radiation as well as power reactors within the state.

Approximately 4.5 person-years of the program's activities (excluding clerical) are devoted to environmental monitoring, while 5.5 are spent on university/medical monitoring. It is currently staffed with radiological health specialists, chemists, and X-ray technicians. Within the next two years, it is anticipated that the program will add to its staff one nuclear engineer and an additional clerk. Activities should grow in the area of nuclear medicines and non-ionizing consumer products monitoring.

The growth and decline for this program between 1978 and 1981 would not be speculated about by program officials, but it was indicated that the areas of non-ionizing radiation monitoring such as consumer products, should continue to develop and should eventually result in a demand for careers in research and monitoring of these presently unregulated devices. There could develop a demand for researchers as well as technical monitors if legislation is enacted within the state to regulate and control the radiation emitted by these products.

VI. SOLID WASTE

The Bureau of Solid Waste Disposal (BSWD) is located in the Department of Environmental Management of the Massachusetts Executive Office of Environmental Affairs (EOEA). Although regulatory responsibilities are charged to the Division of Environmental Quality Engineering under EOEA, the Bureau of Solid Waste Disposal is considered the primary planning group for solid waste management in Massachusetts.

The statewide plan for resource recovery facility development appears to be aggressive, but perhaps politically unacceptable due to the state legislature's questionable commitment to providing for an adequate state program. The impact of PL: 94-580 is also questionable at this time. The most significant impact of this new law will take the form of aiding Massachusetts in developing a statewide hazardous waste management program. As Massachusetts has exhibited proficiency in resource conservation and recovery, the impact of this Act will not likely be as extensive as it will be in states with no programs in existance. Currently the towns of Marblehead and Sommerville are both operating municipal separate collection solid waste programs under demonstration grants from EPA.

VII. WASTEWATER

The Division of Water Pollution Control (DWPC), in the Department of Environmental Quality Engineering, is the Massachusetts agency concerned with the management of wastewater treatment facilities. This Division distributes construction grants funds to the cities and towns of the state by authority of the Federal Water Pollution Control Act (FWPCA).

The Division is mostly staffed with sanitary and civil engineers. At the local level, there exist approximately 600 wastewater treatment plants in the state. It has been estimated that monies obligated under construction grants program have so far created 7,000 engineering and construction jobs as well as 800 permanent jobs involved in the operation and maintenance of these facilities. Program professionals estimate that, with a substantial amount of funding still to be obligated, about two to three thousand additional engineering and construction jobs may be created. The industrial sector will likely not experience any workforce growth as they are generally in compliance with existing effluent standards.

VIII. ENERGY

The Massachusetts Energy Policy Office is an executive office established to advise the Governor, provide coordination among state agencies regarding outer-continental shelf oil development, and to develop energy conservation programs.

The short term energy goal for Massachusetts is increased energy efficiency. Extensive consumer education efforts have been implemented toward this end. Programs to encourage and promote construction and use of energy-efficient commodities have been developed.

The Energy Facilities Siting Council is composed of four cabinet secretaries and five Governor-appointed citizens. The Council reviews questions of need and choice of sites for gas and electric facilities and major oil facilities.

The Division of Standards, Executive Office of Consumer Affairs, is responsible for fuel allocation. The Boston Energy Office is a quasi-official agency brought about by direct cooperation between government agencies and the academic community. The Office is totally student-staffed and is involved in innovative projects to address energy issues which affect Boston.

COMMONWEALTH OF MASSACHUSETTS - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR[1]	600	--	--	--	--	612	N/A
NOISE[2]	7	7	7	7	7	7	0%
PESTICIDES[3]	4414	10414	--	--	--	--	N/A
POTABLE WATER[4]	17	--	--	--	--	--	N/A
RADIATION[5]	13	--	15	--	--	--	N/A
SOLID WASTE[6]	10	--	--	--	--	--	N/A
WASTEWATER[7]	111	--	--	--	--	--	N/A
ENERGY[8]	--	--	--	--	--	--	N/A
TOTALS	5172	--	--	--	--	--	N/A

[1]The above reflects 100 state agency and 500 known private sector personnel.

[2]The above includes approximately six state agency headquarters and field personnel.

[3]The above figure for 1976 includes 4 state agency personnel, 10 Pesticide Board members, 4,000 certified applicators, and 400 pesticide dealers. Growth in 1977 is attributable to an anticipated 10,000 certified pesticide applicators.

[4-8]The above include only state agency personnel.

EDUCATION

The Commonwealth of Massachusetts offers a number of environmental science and pollution control programs through its colleges and universities. A sampling of these programs was conducted and is shown in detail in the complete Massachusetts report. The programs are designed to prepare students for technical and professional positions in pollution control and related fields.

Harvard University offers graduate degrees in Environmental Health Science and Environmental Sciences and Engineering. Options are available in water, industrial, and urban planning areas. Worcester Polytechnic Institute has majors in Environmental Engineering, Sanitary Engineering and Water Resources, and Environmental Planning.

Most environmental education offerings stress inter-disciplinary involvement and the various societal impacts on the environment. A large number of the programs have originated during the 1970's because of increased concern with the environment; enrollment has reflected this growing interest.

LEGISLATION

The environmental/energy legislation for Massachusetts was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Environmental Cause of Action Law

Environmental Protection Law

Air Pollution Control Laws

Motor Vehicle Pollutant Control Devices Law

Pesticide Law

Radiation Protection Laws

Solid Waste Disposal Law

Restriction on Out-of-State Rubbish
Acts of 1971

Hazardous Waste Law

Board of Certification of Operators Law

Clean Water Act

Petroleum Discharge Law

Wetlands Protection Laws

National Environmental Energy Workforce Assessment

Phase I

MASSACHUSETTS

State Report

COMMONWEALTH PROFILE

Massachusetts covers 8,257 square miles. It extends 190 miles east to west, and 110 miles north to south. The jagged coast extends 1,500 miles; in the southeast Cape Cod protrudes 65 miles into the Atlantic. The coast consists largely of glacial scoured rocks; the central portion holds hard, flat, stony, upland pastures. The Connecticut River Valley and the Berkshire Hills form the relatively fertile land to the west. Massachusetts has 19 main river systems (the Connecticut, Charles, and Merrimack are the three longest) and 1,200 ponds and lakes. Nearly all rivers and many of the lakes and ponds are heavily polluted but are improving as a result of state environmental iniatives.

The 1975 estimated population of Massachusetts was 5,828,000 (tenth ranked of the states). Boston is the heaviest populated area with about 625,000 people. Springfield and Worcester have approximately 175,000 each.

One-half of the income derived from manufacturing in New England is generated in Massachusetts. Total value added by manufacture is more than $11.7 billion a year. Per capita income was $6,150 in 1975.

Massachusetts has become a leading state in aerospace research and development. Many facilities are located in the western suburbs of Boston. Electrical machinery, including electronics and communications equipment, is the largest state industry in terms of numbers employed and value added by manufacture. Massachusetts is still a leading state in shoe manufacture. Other products include watches, rockers, cutlery, hand tools, guns, motorcycles, medical instruments, and mini-computers.

The fishing industry has suffered from pollution of coastal waters and from intensified competition. Modern trawlers account for the majority of the fishing catch which totaled $78 million in 1975. Agricultural receipts, topped by the cranberry production (second in the U.S.), totaled $201 million in 1975. Poultry and dairy products, apples, peaches, and maple syrup added to farm receipts. Mineral production, primarily stone, sand, and gravel, accounted for $52.3 million in 1975. Tourism has developed into an important segment of Massachusett's economy. Attracted by numerous recreation areas (including 108 state forests and reservations) and the historic landmarks, tourists annually generate $1.5 billion.

Massachusetts Pollution Abatement and Control Agencies

Massachusetts pollution abatement and control responsibilities are in the five departments of the Executive Office of Environmental Affairs, with adjunct responsibility in the Executive Office of Human Services and the Energy Policy Offices. The Executive Office of Environmental Affairs has the following departments: Environmental Management, Environmental Quality Engineering, Fisheries, Wildlife, and Recreational Vehicles, Metropolitan District Commission, and Food and Agriculture. The Executive Office of Human Services conducts the state's radiation programs. The Division of Standards, in the Executive Office of Consumer Affairs, is responsible for energy programs as is the Division of Registration, which handles the certification of potable water and wastewater treatment operators.

The Department of Environmental Management is mandated to supervise the state's groundwater, surface water, forests and other large land masses. The Department also oversees the state's fragile coastal wetlands and is charged to protect, enhance, and develop the natural resources of Massachusetts. The Department of Environmental Management accomplishes these tasks through its three divisions. The Division of Forests and Parks is concerned with forestry management and recreation. The Division of Solid Waste Management has embarked on a plan to build five regional resource recovery systems that would extract recyclable materials and use the remaining garbage as an alternate source of energy. The Division of Water Resources is responsible for the management of surface and ground-

water, for flood control and stream improvement projects, and for the identification of flood plains, wetlands, and scenic river areas.

The Division of Environmental Quality Engineering is the state's environmental regulatory agency and consists of four operating divisions. The Division of Land and Water Use is responsible for the Wetlands Program, the Waterways Program, the Community Sanitation Program, and the Outdoor Advertising Program. The Division of Air and Hazardous Materials is responsible for air pollution, noise, and pesticides control and solid waste management. This Division consists of five air quality branches: Surveillance, which includes monitoring and data analysis; Engineering, which includes noise control; Systems Management; Stationary Source Planning; Mobile Source Planning; and Standards and Compliance; along with the Pesticides and Solid Waste Branches. The Pesticides Branch enforces pesticide regulations, licenses pesticide applicants, investigates alleged violations of regulations and other alleged misuses of pesticides, provides technical guidance and acts as liaison to the University of Massachusetts Cooperative Extension Service. The Solid Waste Branch coordinates selected inspection and planning activities for the regional staff of the Department of Environmental Quality Engineering as they pertain to refuse disposal facilities.

The Department of Environmental Quality Engineering, Division of Water Supply is the state agency responsible for testing all water supply systems in the state and for approving all new water systems, resources, and well sites. The Division of Water Pollution Control is concerned primarily with the management of wastewater treatment facilities. This Division channels federal water clean-up funds to cities and towns to meet

current and future water quality standards and can insist on industrial and municipal water treatment which assures water quality. The Division has the goal of eliminating pollution from municipal and industrial water supplies by the mid 1980's and is the foremost state agency concerned with oil, oil spills, and oil clean-up operations in the marine environment.

The Department of Fisheries, Wildlife, and Recreational Vehicles manages, researches, and protects inland fisheries and wildlife.

The Metropolitan District Commission serves the water, Parks and Recreation, and sewerage needs of cities and towns in the greater Boston area.

The Department of Food and Agriculture is responsible for the preservation of agricultural lands and the issuance of an adequate supply of high quality farm products. Part of this mission is achieved through the Division of Plant Pest Control which certifies nursery stock, enforces plant pest laws, inspects for various insects, and advises on their eradication.

The Massachusetts radiation program is the Department of Public Health of the Office of Human Services.

The Energy Policy Office has the following purposes: to advise the Governor on energy policy, to develop energy conservation programs, and to provide coordination among state agencies relative to outer-continental shelf oil development.

A spokesman for the Massachusetts Executive Office of Environmental Affairs provided the following information concerning workforce projections for that Office:

- The state has no workforce planning in the environmental fields although it might be possible for the state's education department to provide some type of training funds;
- The three principal areas of concern and growth in Massachusetts are sewage treatment, resource recovery, and drinking water;
- The construction grant program has created some 7,000 construction jobs and the plants themselves will create about 800 permanent jobs;
- No major pollution control and abatement legislation is foreseen in the near future;
- There is an expansion of new firms in Massachusetts which deal in pollution abatement and control technologies;
- Oil and natural gas exploration off of the Massachusetts coast will have an impact in about five years;
- There is an expansion potential for pollution abatement and control employment in Massachusetts; and
- The Department of Environmental Quality Engineering has decreased 8% in budget in the past year and a half and will decrease an additional 10% over the next four years. However, internally, the regulatory division will increase in its budget allotment within the Department.

Pollution Control and Abatement Programs

I. AIR

A. Introduction

The Commonwealth of Massachusetts' Air Pollution Control Program is administered by the Air and Hazardous Materials Division of the Department of Environmental Quality Engineering (DEQE), Executive Office of Environmental Affairs. The Division, recently reorganized, develops statewide policies pertaining to air pollution abatement and control as mandated by the state legislature and the Clean Air Act of 1970. It recommends to the Commissioner of the Department of Environmental Quality Engineering goals, priorities and objectives for the Division's air programs and for air programs of DEQE's four regional offices. Specifically, the following activities, provided by DAHM, summarize the Division's recently developed Air Pollution Control objectives and proposed activities.

1) Develops and reviews air criteria, guidelines, standards, and regulations;

2) Oversees and reviews the activities of the Regions in administrating and enforcing all air pollution control programs;

3) Maintains liaison with federal (EPA) and other state agencies;

4) Prepares and develops the Division budget and allocates funds to the regional air programs;

5) Performs staff training activities and provides technical services to the Regions;

6) Develops a Public Information Program on air pollution control.

Specific permit and review programs operated by the Air Program include:

A) New and Modified Sources of Air Pollution

Purpose

The Department requires that these potential sources of air contaminants submit plans, specifications, proposed Standard Operating Procedure, and the proposed Maintenance Procedures for any new or modified facility for a review to determine conformance with state and federal regulations, including conformance with emission limitations contained in Massachusetts regulations, Federal New Source Performance Standards (NSPS), and National Emission Standards for Hazardous Air Pollutants (NESHAPS), and assurance of continued conformance with Massachusetts and Federal National Ambient Air Quality Standards (NAAQS). These regulations are designed to achieve, maintain, and enhance air quality in the Commonwealth.

B) Open Burning

Purpose

Regulations prohibit the open burning of any combustible material without the approval of the Department. The regulations exempt burning for cooking purposes, burning from blow- and welding torches, burning in normal agricultural operations, and burning of fungus-infested elm wood. The review is designed to prevent harmful emissions.

C) Fuel Additives

Purpose

Regulations designed to prevent any fuel additive from causing emissions of air contaminants in violation of the regulations.

D) Sources of Organic Vapors

Purpose

Regulations ensure that any new or modified organic material storage or loading sources will be designed to minimize unnecessary emissions of hydrocarbons, which contribute to the formation of photochemical oxidants or smog.

E) Source Registration and Authorization for Operation

Purpose

Source registration allows the Department to maintain an up-to-date emission inventory. A Federal mandate requires that certain air contaminating sources be surveyed on a regular basis.

F) Variances

Purpose

The Department will allow a variance from these regulations when, after a good faith effort has been made to comply with the regulations, the Department determines that compliance is impossible or when the benefits expected to be derived from requiring compliance are substantially outweighed by the cost to such person and the loss to the public resulting from compliance, and that granting such a variance would have no significant deleterious effect on public health.

The air program has assumed the following delegations of authority for the Clean Air Act in its State Air Implementation Plan.

1) Stationary sources
2) Transportation Control Plans
3) Inspection and maintenance for emission control devices (tentatively will assume if legislation is passed).
4) New source review
5) Ambient air quality monitoring
6) Minor sources

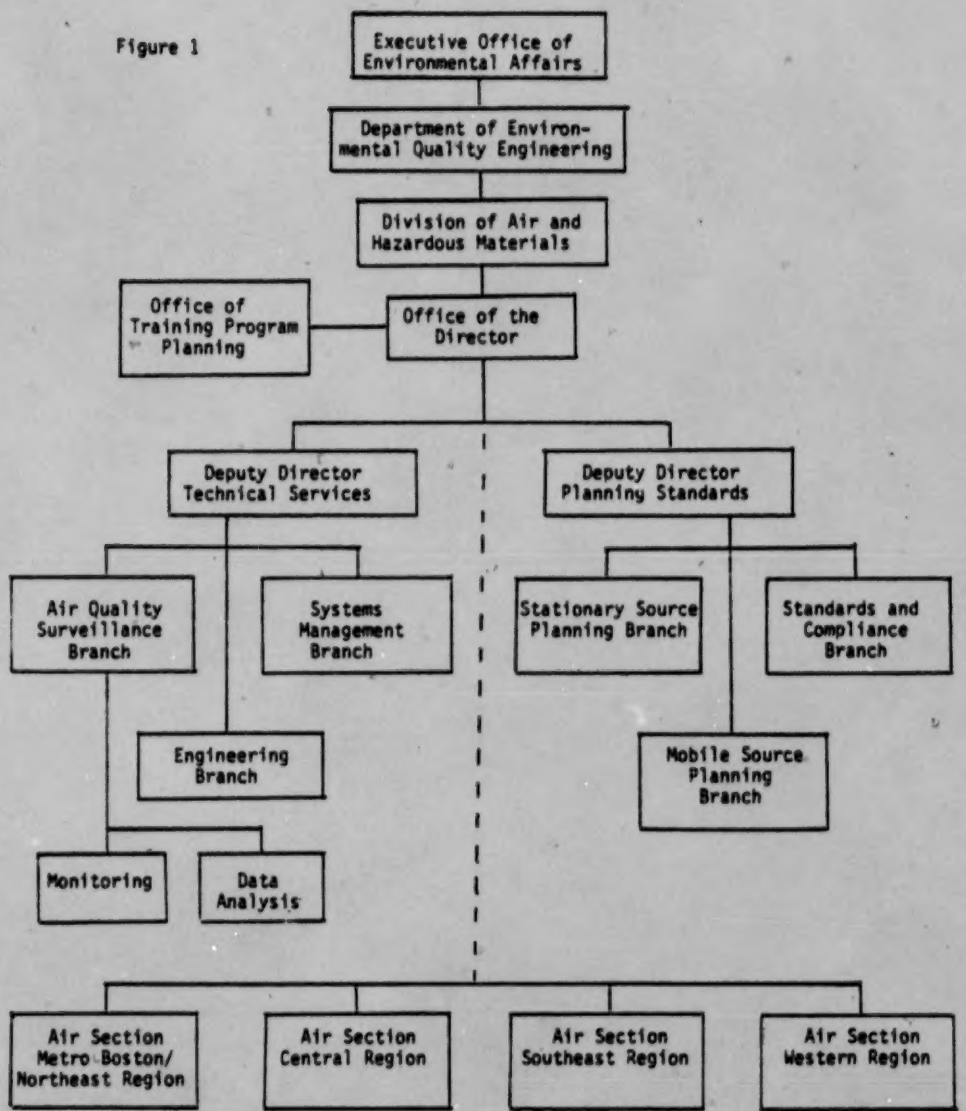
B. Workforce Profile

The Air Program of the Commonwealth of Massachusetts has the organizational structure depicted on the following page.

As shown, the Air Pollution Control Program is a multi-faceted organization divided primarily into a Technical Services Division and a Planning and Standards Division with four field sections. The following descriptions of program functions were provided by the Division of Air and Hazardous Materials. Included, also, is a functional statement for the Office of Training and Program Planning which, in addition to the air program, has adjunct responsibilities to the division's solid waste, noise, and pesticide programs.

MASSACHUSETTS AIR POLLUTION CONTROL PROGRAM

Figure 1



FUNCTIONS OF MASSACHUSETT'S AIR PROGRAM

Deputy Director for Technical Services

Provides monitoring, engineering, data processing and other technical support to the Division and to Air Quality and Solid Waste sections of the Regional Offices.

1. Air Quality Surveillance Branch

- Develops policy on ambient air quality monitoring
- Designs and operates ambient air quality monitoring network
- Designs and operates quality assurance program
- Analyzes and reports ambient air quality data

a. Monitoring Section

- Designs and operates ambient air quality monitoring network
- Performs special air quality monitoring
- Designs and operates quality assurance program
- Validates ambient air quality data

b. Data Analysis Section

- Analyzes ambient air quality data
- Prepares reports on the status of air quality
- Operates and reports the pollutant standards index

2. Engineering Branch

- Develops policy on engineering plans review
- Provides training and technical assistance to Regional Offices on engineering plans review, air pollution control technology and noise control
- Coordinates the development of emission inventories

3. Systems Management Branch

- Provides data processing support to the Division and Regional Offices
- Operates
  - Activity Management System
  - Air Quality Data Handling System
  - Enforcement Management System
  - Emission Inventory System
  - Performs air quality modeling under direction of the Stationary Source Planning Branch

Deputy Director for Planning and Standards

Develops plans for air quality improvement; determines the consistency of transportation plans with air quality implementation plans; develops air quality and emission standards; produces MEPA environmental impact reports; develops policy on and determines source compliance and enforcement.

1. Mobile Source Planning Branch
   - Develops transportation control plans for Set II pollutants
   - Coordinates transportation plan consistency review
   - Develops air quality maintenance plans for Set II pollutants
2. Stationary Source Planning Branch
   - Develops attainment and maintenance plans for Set I pollutants
   - Develops and reviews Chapter 494 state implementation plan revisions
   - Develops plans and policy for the prevention of significant deterioration of air quality
   - Coordinates the review of MEPA environmental impact reports
   - Directs air quality modeling activities
3. Standards and Compliance Branch
   - Develops ambient air quality and emission standards
   - Develops policy on implementation of Chapter 494 state implementation plan revisions
   - Develops policy on source compliance and enforcement
   - Coordinates enforcement referrals to the Attorney General
   - Coordinates enforcement activities with EPA
   - Coordinates the status of source compliance with regulations
   - Coordinates input to the Compliance Data System

Office of Training and Program Planning

- Coordinates and prepares the Division's annual program plan and budget
- Develops systems and procedures to evaluate program effectiveness and resource allocations
- Provides broad Division and Regional program policy analysis including analysis of environmental strategies, resource utilization and program alternatives
- Develops a comprehensive training program for the Division and Regional Air and Hazardous Materials personnel
- Develops and coordinates a career development program for Division and Regional Air and Hazardous Materials personnel

- Develops and coordinates a public education program on air pollution, noise, and pesticide control, hazardous waste and solid waste management.
- Provides management analyses of Division and Regional organization and functional assignments as they relate to manpower utilization goals and associated management improvement efforts.

Due to the recent reorganization of the Division of Air and Hazardous Materials, it was felt that an accurate workforce profile could not be provided. However, a general description of the air pollution workforce was provided, and it was estimated that about 100 people are employed statewide in state air pollution abatement and control functions. About 60 individuals are located among the program's four field operations. Out of these 100 positions, there are currently 19 vacancies.

A workforce profile of the significant private sector Air Pollution Abatement and Control activities in Massachusetts was provided and the following table summarizes this information.

TABLE I

COMMONWEALTH OF MASSACHUSETTS

Significant Private Sector Air Pollution Control Efforts

Firm Name	Specialization Area	Workforce Estimate
Environmental Research and Technology	Power Company Consultant, specialize in Air Quality Monitoring and Diffusion Modeling	350 (50 meteorologists)
Walden Research Division of ABCPR	Stack Sampling and Diffusion Modeling	50
Energy Resources Corporation	Energy and the Environment	100

Additionally, Boston Edison and New England Electric (Power Companies) have significant efforts in Air Pollution Abatement and Control. General Electric and Monsanto Divisions in Massachusetts are said to posses excellent

air-related programs. No staffing levels were available for these companies. Finally, no workforce profiles were available for local/municipal efforts.

C. Workforce Projections

Employee turnover within the DAHM air programs is greatest among the young professional employees who tend to leave the Massachusetts Civil Service System for higher paying jobs in the private sector, primarily with engineering consulting firms. Professional air pollution control engineers have also left for the federal sector with substantial salary increases.

Tentative workforce projections through 1981 suggest that the program will experience a 10% growth rate which would result in staffing of 10 to 12 additional positions. No specifics were available as far as classification of positions was concerned; and professionals in the program believe that to count on the acquisition of 10-12 additional positions over the next five years is optimistic. As for the immediate future, there will be no increases in staffing level. It is anticipated that during 1978, legislation will be introduced which, if enacted, would augment air program activities, resulting in the addition of the previously estimated number of positions.

Actual needs for the state air program far surpass projected workforce growth. Professionals in the field assert that the Massachusetts air program should have at least 50 more professional and technical positions (employed in all categories of positions) for an effective approach to controlling and abating air problems in Massachusetts. A need for greater diversification of expertise was indicated. Many professionals are well versed in combustion-related point source pollution, but possess little knowledge of mobile source pollution.

D. Training and Certification

For 1976 the Massachusetts State Air Program had no state funds available for sponsoring or procuring training for its employees. The general attitudes and philosophy behind this situation which, sources suggest, pervades most of Massachusetts State Government emanate from the current administration's belief that an agency or department with a staff vacancy to fill, should limit itself to hiring only an individual throughly prepared and trained for entry into this position; thus saving "unnecessary" training costs. Unfortunately this attitude has resulted in the failure of some air program professionals to keep abreast and informed about developments in air pollution control due to the lack of access to continuing education and training once on board.

However, through the air program's federal granting authority, a limited number of training funds are available. During 1976, these funds were used to support the attendance of 10 state employees at EPA sponsored workshops conducted by the Air Pollution Training Institute (APTI). Additionally, 53 other individuals, primarily representing industry and a few municipal governmental officials, attended APTI courses. In all, 63 people from Massachusetts attended in these sessions.

Training sponsored by EPA for the Massachusetts' air program might be classified at this time as having a limited degree of success. The present mechanism of offering training to the state is centered around a cost recovery, self-supporting concept. The money used to finance training for air program personnel comes directly from the money which has been granted to them by EPA to support implementation of the state's air program. Due to the fact that EPA is not receiving additional funds for this grant program, and at the same time is urging Massachusetts to

assume greater and greater responsibilities, the end result is that training costs incurred by DAHM are at the cost of operating a minimally acceptable program.

At this time, the most critical training needs of DAHM personnel are:

1) Management
2) Supervision
3) Non-point source air pollution (mobile sources)

As mentioned in the workforce profile, DAHM has recently established an Office of Training and Program Planning to develop a comprehensive training program as well as a career development program for Division and Regional personnel. However, the availability of funds will be the limiting factor determining the degree of success of the program.

Other recent training programs concerned with air pollution abatement and control in Massachusetts include an agreement by EPA with the state to fund a program to train instructors in motor vehicle emissions control. The funds will be used to train instructors in specific techniques of motor vehicle emissions testing. In turn, these individuals will be responsible for incorporating these techniques into community vocational high school curricula as well as continuing education programs for auto mechanics. It is hoped that as soon as the Massachusetts State Legislature ratifies mandatory inspection and maintenance guidelines for anti-pollution devices on motor vehicles, there will be a trained workforce which can recognize violations of federal emissions standards and take necessary corrective action to ensure that all vehicles equipped with pollution control devices meet the prescribed federal standards. Incorporation of these techniques into the curriculum offerings is expected to be completed by July, 1977.

E. Career Potential

Career potential in Massachusetts for professional air pollution control personnel appears good in the private sector, as a consequence of more stringent enforcement of state and federal regulations. Several governmental employees have left to take better paying positions in air pollution control engineering consulting firms.

Although specific career opportunities are not readily identifiable, sources suggest that private sector positions will require a well integrated combination of analytical and engineering skills. Careers at the state level with the Massachusetts Division of Air and Hazardous Materials will likely occur through attrition. Although, 10-12 additional new positions have been projected over the next five years, they will have little impact on statewide air pollution control job opportunities.

The most promising area for new careers will exist in the non-degreed vocational workforce. As outlined in the section on training and certification, EPA has funded a program to incorporate motor vehicle emission testing techniques into vocational high school curricula. Massachusetts is in the legislative proposal state of mandatory statewide inspection of motor vehicle exhaust emissions and emission control equipment, which is an important part of its required Transportation Control Plan (TCP). It is hoped that through early curricula placement and implementation, an adequately trained workforce will be available to recognize violations of federal/state emissions standards when the state plan is ratified. At this time there is every indication that it will be.

F. Conclusion

The air program of the Division of Air and Hazardous Materials is presently undergoing a reorganization and reappraisal of program objectives and strategies. Once reorganization is completed, program officials anticipate a re-direction of program priorities. As far as reliable workforce projections are concerned, they rest upon increases in federal assistance to the state under the Clean Air Act of 1970. The outlook for increased state expenditures devoted to air pollution control is at best tenuous; and, in fact, some questions have arisen as to whether or not the state can maintain its current level of funding. If not, then federal law states specifically that federal grants may be terminated. However, based on realistic forecasts, a probable 1-2% per annum growth rate in the state air workforce will prevail.

Training needs are quite specific with the greatest being in the areas of supervision and management. Presently, most employees are technically oriented, a situation which has caused problems in program function and management.

At the local and private levels, workforce estimates and projections are unavailable. However, considerable career potential for skilled automobile emissions control technicians will develop if the legislature ratifies an inspection and maintenance (I & M) program as necessitated by its most recent Transportation Control Plan. If ratified, a cadre of trained inspectors will be needed throughout the state to maintain the emission control systems of all registered vehicles. It is anticipated that this strategy will aid in the attainment and maintenance of satisfactory ambient air quality standards.

II. NOISE

A. Introduction

Noise control in the Commonwealth of Massachusetts is administered by the Air and Hazardous Materials Division of the Department of Environmental Quality Engineering (DEQE). Currently within the state there is no legislative mandate for the abatement and control of noise pollution, however, a loose interpretation of existing air laws has enabled the state to develop limited noise regulations. The extent of current noise regulations in Massachusetts can be seen on the following page. The state has established a regulation which prohibits the unnecessary emission of noise. Through this authority Massachusetts has established property line sound level limit regulations requiring submission of noise data from new or modified facilities which generate substantial noise levels. Specifically, approval for a facility will be granted if the installation or modification of the noise source does not:

1) Increase the broadband noise level in excess of 10db above existing ambient noise levels;

2) produce a pure tone condition.

The Registry of Motor Vehicles within the Commonwealth is responsible for motor vehicle sound emissions; however, only regulations for off-road Recreational Vehicles and Snowmobiles have been promulgated. It has been said that despite the existence of these standards, the Registry has little, if any, interest in enforcing compliance except in cases of gross non-compliance. Generally, the state's noise regulations are vague and the extent of enforcement has been left to the discretion of the administering agency.

Regulation 10. Noise

10.1 U No person owning, leasing, or controlling a source of sound shall willfully, negligently, or through failure to provide necessary equipment, service, or maintenance or to take necessary precautions cause, suffer, allow, or permit unnecessary emissions from said source of sound that may cause noise.

10.2 U Regulation 10.1 shall pertain to, but shall not be limited to, prolonged unattended sounding of burgular alarms, construction and demolition equipment which characteristically emit sound but which may be fitted and accommodated with equipment such as enclosures to suppress sound or may be operated in a manner so as to suppress sound, suppressable and preventable industrial and commercial sources of sound, and other man-made sounds that cause noise.

10.3 U Regulation 10.1 shall not apply to sounds emitted during and associated with

a) parades, public gatherings, or sporting events, for which permits have been issued provided that said parades, public gatherings, or sporting events in one city or town do not cause noise in another city or town;
b) emergency police, fire, and ambulance vehicles;
c) police, fire, and civil and national defense activities; and
d) domestic equipment such as lawn mowers and power saws between the hours of 7 A.M. and 9 P.M.

10.4 U Regulation 10.1 is subject to the enforcement provisions specified in Regulation 52.1.

Regulation 11. Transportation Media (be referred to Regulation 6)

11.1 U Motor Vehicles

11.1.1 All motor vehicles registered in the Commonwealth shall comply with pertinent regulations of the Registry of Motor Vehicles relative to exhaust and sound emissions.

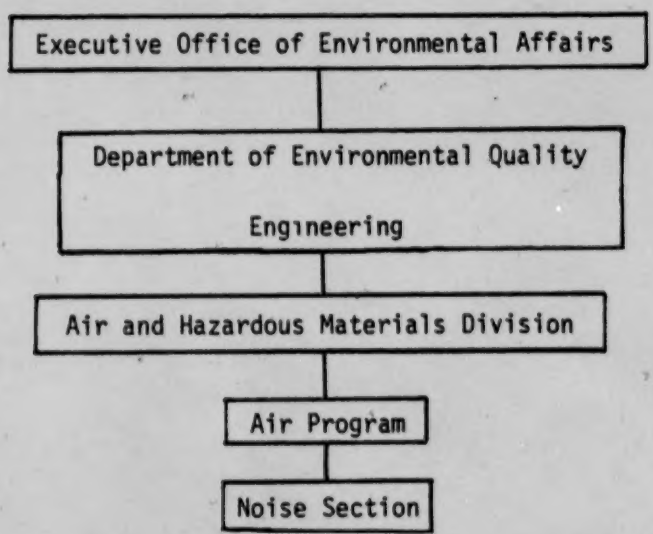
11.1.2 No person shall cause, suffer, allow, or permit the unnecessary operation of the engine of a motor vehicle while said vehicle is stopped for a foreseeable period of time in excess of five minutes. This regulation shall not apply to

a) vehicles being serviced, provided that operation of the engine is essential to the proper repair thereof, or
b) vehicles engaged in the delivery or acceptance of goods, wares, or merchandise for which engine assisted power is necessary and substitute alternate means cannot be made available, or
c) vehicles engaged in an operation for which the engine power is necessary for an associated power need other than movement and substitute alternate power means cannot be made available provided that such operation does not cause or contribute to a condition of air pollution.

B. Workforce Profile

The Noise Program of the Executive Office of Environmental Affair's has the following organizational structure:

Massachusetts Noise Program Organization



Currently, there are two individuals concerned directly with noise abatement and control. Both are engineers; however, one devotes only part-time to program administration while the other professional is full-time. About 1.2 person-years are devoted to noise at DEQE's headquarters level. Within the department's four regional field offices, about 3.5 person-years are devoted to noise abatement and control, making DEQE's entire effort about 4.7. At the municipal level, Boston appears to be the only municipality in the state which has one full-time professional engineer regulating excessive sound levels through a city noise ordinance. Table II is included to show the communities within Massachusetts which have known ordinances. This table is not intended to evidence the existence of formal noise programs, it merely identifies local legislation which may

or may not be effective in abating community noise levels. However, it does show a concern with establishing regulations requiring specific acoustical criteria as opposed to laws which have no such delineations and are thus difficult to enforce. About 22% of the state's population is served by these local ordinances.

TABLE II

COMMONWEALTH OF MASSACHUSETTS

Municipal Noise Ordinances - 1976*

Jurisdiction	1970 Population	Nuisance	Zoning	Vehicle	Rec/ Vehicle	Railroad	Aircraft	Construc-tion	Building
Acton	14,770	-	0	-	-	-	-	-	-
Boston	641,070	X	X	X	-	-	-	-	-
Concord	16,148	0	-	0	0	-	-	0	-
Fall River	96,898	0	0	-	-	-	-	-	-
Milford	19,352	-	X	-	-	-	-	-	-
Newton	91,263	0	-	0	-	-	-	-	-
Pittsfield	57,020	X	-	X	-	-	-	-	-
Springfield	163,905	0	X	-	-	-	-	-	-
Worcester	176,572	0	-	-	-	-	-	-	-

Key: X Regulation includes acoustical criteria
0 Regulation does not include acoustical criteria
- No regulation

Source: Sound and Vibration, December, 1976: Clifford R. Bragdon, Georgia Institute of Technology

C. Workforce Projections

Due to the state's current austerity minded legislature the prospects for increased expenditures for the noise control program of DEQE are poor.

Federal funding at this time does not exist, nor is it anticipated, thus, no increases in noise staffing levels can be expected to occur over the next five year period. The best the program can hope for in the immediate future is to be granted authority by the legislature to develop and promulgate specific acoustical standards. This would necessitate a larger workforce if a strict enforcement is advocated.

D. Training and Certification

The only training offered to noise program personnel of DEQE has come in the form of a 2-4 day noise control workshop sponsored by EPA Region I which provided the department with introductory and technical training in environmental noise pollution. Other offerings in the area include acoustical courses at Harvard and M.I.T. as well as a continuing education engineering program at Northeastern which has at least one noise course. Finally, the Air and Hazardous Materials Division of DEQE has recently established a training office which should result in an expansion of training resources for state and local noise personnel in Massachusetts.

E. Career Potential

Due to the lack of any projected increases in state noise program staffing levels, the potential for careers in noise control over the next five years will be limited, at best, until either EPA or Massachusetts decides to bolster the program with additional funding. Most likely, local level increases will be pursuant to state initiatives which appear to be presently at a plateau. Careers in the private sector will also most likely be a function of federal and state requirements and standards, which are not anticipated to develop in any areas beyond new product noise regulations, at least within the next five years.

F. Conclusion

The Noise Control Program of Massachusetts' Executive Office of Environmental Affairs has been a subordinate function of the state's pollution abatement and control effort and will remain so until the public demands legislative initiatives requiring a concentrated effort in this area. Only an effort toward developing a trained workforce in noise control will satisfy a functional statewide effort. In order to derive this particular labor force within Massachusetts, financial assistant from EPA appears to be the only alternative. As mentioned before, the current thrust of federal noise regulations is directed towards attacking the noise problem at its origin -- with the manufacturers. In order to ensure that warranted products are meeting acoustical requirements as promulgated by EPA, a field inspection and monitoring network must be established within the state to address primarily the local level. Since a certain amount of specific scientific training would be required for the aforementioned activities, it would appear that two year institutions in the state could satisfy the basic educational needs of this proposed workforce.

III. PESTICIDES

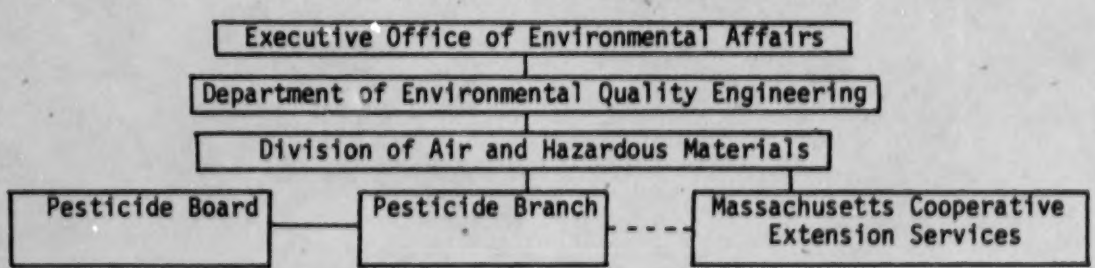
A. Introduction

In Massachusetts, the Pesticide Branch, under the Executive Office of Environmental Affairs, is responsible for all uses and applicators of pesticides within the state. The Department of Public Health is responsible for registration of pesticides distributed within the state. Currently the pesticide law in Massachusetts does not meet the federal criteria promulgated under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). The state plan for operator certification, mandated by this Act, is finished but spokespersons for the program believe that it has no chance of being ratified by the state legislature. Currently, the laws in the state call for certification of applicators who apply pesticides on land only, which does not satisfy the other types of applicator certification mandated by FIFRA.

B. Workforce Profile

Pesticide control responsibilities of the Executive Office of Environmental Affairs are organized in the following manner.

Massachusetts Pesticide Program Organization


Executive Office of Environmental Affairs
Department of Environmental Quality Engineering
Division of Air and Hazardous Materials
Pesticide Board
Pesticide Branch
Massachusetts Cooperative Extension Services

The functions of the Pesticide Branch are as follows.

1) Carries out policy set by the Pesticide Board
2) Enforces regulations promulgated by the Pesticides Board
   a) licenses pesticide applicants
   b) investigates alleged violations of regulations
   c) investigates other alleged misuse of pesticides.
3) Provides technical support to the Pesticide Board
4) Prepares for, records and transcribes the meetings and hearings of the Pesticide Board.
5) Provides technical guidance to state and local agencies in the area of pesticide use in such a way that the policy of the Board is fostered to the greatest extent possible. Provides such technical guidance to private citizens.
6) Provides liaison with the Cooperative Extension Service to ensure that pesticide use policy reflected by that agency is consistent with that of the Board.

Presently, there are four individuals charged with implementing and developing the state's pesticide use program. Table III is included to depict the positions involved in the Branch.

TABLE III

EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS

Pesticide Branch
Current (1976) Staffing Level (est.)

Position	1976
Program Supervisor	1
Sanitary Engineer	1
Clerk	2
TOTAL	4

This program is responsible to the state's Pesticide Board, of which there are 10 members, 5 public and 5 state.

There are about 4,000 active certified applicators in the state who are, for the most part, commercial. There are 100 primary pesticide dealers and 300 secondary pesticide dealers in the state.

C. Workforce Projections

Workforce Projections for the Pesticide Branch of the Division of Environmental Quality Engineering are not determinable as federally acceptable state pesticides laws are not in effect, nor has a state plan been ratified. However, a proposed staffing level of the Branch for proper FIFRA implementation has been developed and is presented in Table IV

TABLE IV

EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS

Pesticides Branch
Proposed Staffing Level

Position	Proposed
Pesticide Program Supervisor	1
Principal Clerk	1
Senior Sanitary Engineer	1
Senior Inspector of Hazardous Substances and Pesticides	2
Administrative Assistant	1
Senior Engineering Aide	1
Senior Statistical Machine Operator	1
Senior Clerk Typist	1
TOTAL	9

The figure of 9 represents more than a 100% increase over the current staffing level of four. In the private sector it is anticipated that the following numbers of applicators will be certified within the state.

TABLE V

COMMONWEALTH OF MASSACHUSETTS

Proposed Certification
Private Sector Pesticide Workforce

Category	Number
Commercial	
Supervisory	4,000
Operators	2,000
Private	4,000
TOTAL	10,000

It is also anticipated that 300-400 private and commercial applicators will need certification on a per annum basis after the bulk of certification activities are completed.

D. Training and Certification

The Massachusetts State Cooperative Extension Service is responsible for conducting a comprehensive training program for private and commercial pesticide applicators to aid in the attainment of a level of competency required for certification. Due to the current absence of a statewide plan, training and certification requirements are unknown. However, basic training for private and commercial applicators is proceeding on a provisional basis. Generally, Massachusetts is preparing private applicators. Currently there are some problems with foreign speaking individuals who cannot read English. Massachusetts plans to certify applicators on an annual basis.

Table VI shows the current status of commercial applicator training, private applicator training activities and status of all pesticide applicator training in Massachusetts. As the table indicates, Massachusetts has completed just under 50% of its anticipated training responsibilities.

TABLE VI

COMMONWEALTH OF MASSACHUSETTS

Status of Commercial and Private Applicator Training

	Anticipated Training Participants by October, 1977	Numbers Trained as of January, 1977	Numbers Still to be Trained by October 1, 1977
Commercial:	2,200	1,045	1,155
Private:	3,300	1,567	1,733
TOTAL	5,500	2,612	2,888

Source: Regional Support Branch, Operations Division, Office of Pesticide Programs, U.S. Environmental Protection Agency

It should be noted that in the Commercial Category, the summary numbers shown do not represent the number of certified applicators. All figures indicate the number of participants in individual applicator training sessions or a cumulative basis. For instance, one individual might elect to receive training in more than one licensing category; thus, this individual would be counted more than once in these figures. The preceding table merely shows the bulk of training needed, and the figures are not necessarily proportional to the number of certified commercial pesticide applicators.

E. Career Potential

Career potential at the state level over the next five years is indeterminable. Due to the absence of a state plan or the liklihood that the state legislature will ratify the one currently proposed, the size and extent of the state workforce beyond what currently exists is unknown. If a compromise is reached and a state plan for Massachusetts is ratified,

then it appears that the greatest potential for career employment with the Pesticide Branch will be for field inspectors. General requirements will be on the order of an associate degree in a pesticide-related major field of study. Career openings in the private sector are unknown, specifically and will not be readily determinable until the present workforce is more adequately defined. Currently there exists a descrepancy of workforce estimates for the total number of applicators to be certified. The Extension Service maintains that the state workforce will be on the order of 12,000 while program officials of the Pesticide Branch call for a more conservative estimate of 8,000. Despite the differences, it is expected that 300 or more applicators will need initial certification on a yearly basis.

F. Conclusion

The only significant workforce increases in pesticide-related careers will occur in the private sector, as it is expected that several hundred applicators will require certification on a per annum basis after the initial bulk of certification is achieved. Most likely there will be no degree requirements for these individuals. However, a substantial knowledge of pesticides and their use, storage, application, and disposal will be prerequisite to licensing.

IV. POTABLE WATER

A. Introduction

The Massachusetts Water Supply Program of the state of Massachusetts is in the Department of Environmental Quality Engineering (DEQE) of the Executive Office of Environmental Affairs. It is responsible for testing all water supply systems in the state, for approving all new water systems, resources, and well sites. The budget for the Division of Water Supply (DWS) for 1976 is approximately $904,000, total federal and state. Out of this figure $237,000 is provided by EPA Region I with the remainder of the funds provided by the state. Massachusetts state cost estimates for the Safe Drinking Water Act (SDWA) of 1974 implementation are shown in Table VII.

TABLE VII

COMMONWEALTH OF MASSACHUSETTS

SDWA Implementation Funding 1977

State Share	Federal Grant	Total
$666,600	$237,800	$904,400

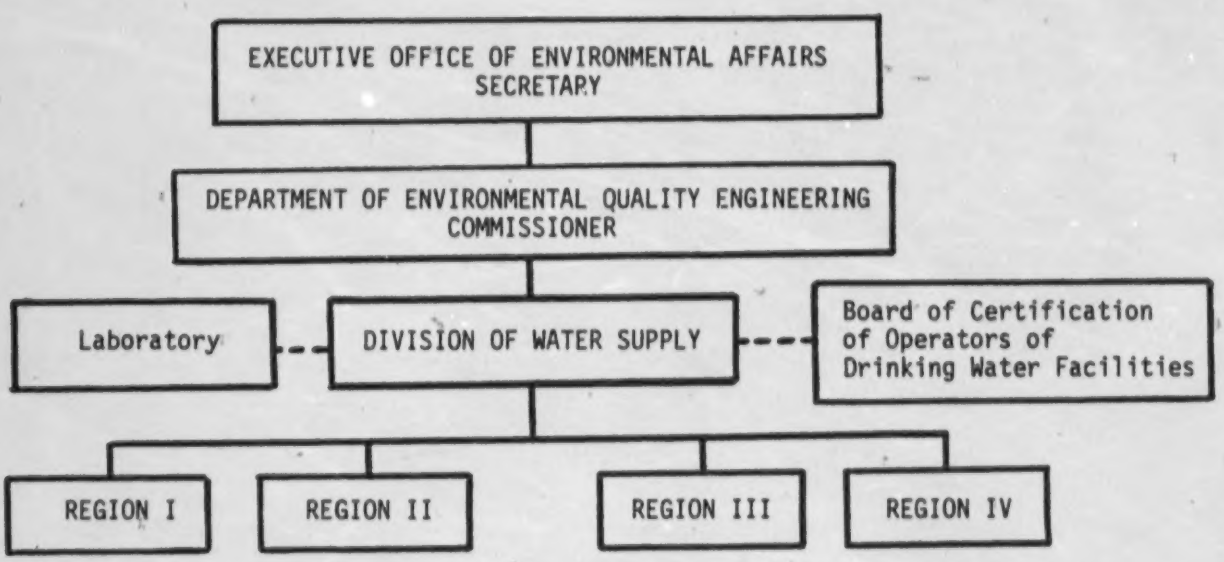
Currently, the state is developing a program which will satisfy all requirements of SDWA. Specifically, Massachusetts is using SDWA funds to 1) formulate and adopt state drinking water standards at least as stringent as EPA's federal standards; 2) adopt a program to certify laboratories performing drinking water analyses; 3) conduct surveillance programs, such as sanitary surveys of water systems and aggregation of information necessary to the granting and review of variances and exemptions to public water supplies; 4) review the design, construction, or modification of drinking water treatment facilities; 5) establish enforcement

programs adequate to assure that individual water supplies perform adequately; and 6) set up and operate the data-keeping and reporting programs required by EPA regulations.

At this time it is anticipated that Massachusetts will assume primacy under SDWA. Plans and regulations have been submitted to the state legislature and a final determination should be known in May.

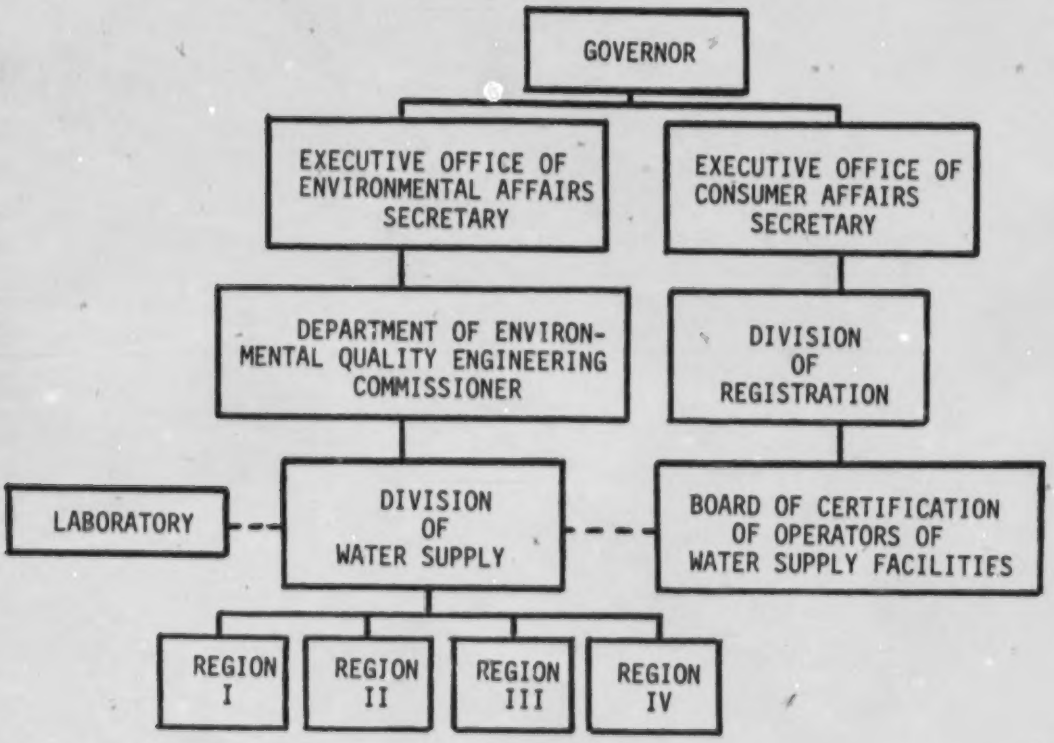
B. Workforce Profile

The Massachusetts Division of Water Supply has the following organizational structure.



As shown, the Division of Water Supply is located in the Massachusetts Executive Office of Environmental Affairs which is Massachusetts' lead environmental agency. Additionally as shown, the Massachusetts Board of Certification of Operators of Drinking Water Facilities is a separate entity from the agency, although employees of the Division of Water Supply coordinate the board's activities. The Commissioner of the Department of Environmental Quality Engineering retains the right to designate the board chairman.

To better understand its relationship to the Executive Office of Environmental Affairs, the following organizational chart has been included.



The board of Certification of Operators of Drinking Water Facilities is in the Division of Registration of the Executive Office of Consumer Affairs. This Division is responsible for all certification/registration activities of the state government, despite program applicability to other Executive Departments. Finally, the Division of Water Supply receives laboratory services from the state laboratory located in Lawrence, Massachusetts.

The staffing level of the Division of Water Supply and its four field offices is depicted in Table VIII.

TABLE VIII

EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS

Department of Environmental Quality Engineering
Water Supply Program
Current (1976) Staffing Level

Position	1976
Immediate Office	
Administrator	1
1st Assistant	1
2nd Assistant	1
Cross Connection Specialist	1
Inspector (engineer)	1
Field Offices	
Regional Chiefs	4
Assistants (2/region)	8
TOTAL	17

Within Massachusetts there are approximately 350 water supplies run by municipal departments of public works. Overall there are 1,200 sources of community drinking water in the state. Numbers of non-community sources have been estimated to be in the 400-450 range.

Massachusetts state law requires that any individual or local government which sells or distributes water must have a certified operator/distributor present and accountable. Additionally, every city and town must have a certified operator regardless of whether or not the municipal supply requires treatment. The certification program does not distinguish between operators or distributors. Both take identical tests and receive identical certificates. Currently, within the state, there are about 1,200 certified operators/distributors. (The training and certification section of this report will present the state's training and certification activities in more detail.)

C. Workforce Projections

Explicit workforce projections for the Massachusetts Division of Water Supply were not available due to the unknown nature of future state or federal funding. However, the Executive Office of Environmental Affairs believes that the three priority areas of concern are the state's drinking water program, its resource recovery program, and the sewage treatment construction grant program. Additionally, due to the lack of workforce planning by Massachusetts' state government beyond immediate needs, staffing level projections through 1981 are not available.

Finally, it should be noted that within the last year an eight percent decrease in the total state budget for environmental affairs has occurred. Additionally, through 1981 an overall ten percent decrease has been mandated. However, internally DEQE will shift program compositions and finances so that priority programs such as water supply can continue to experience much needed growth.

The following table, provided by EPA Region I personnel depicts Massachusetts' likely staffing level and financial commitments for FY 1977 and FY 1978.

TABLE IX

COMMONWEALTH OF MASSACHUSETTS

Division of Water Supply Cost and Workforce Estimates for SDWA Implementation Fiscal Years 1977 and 1978

	State Share	Federal Grant	Total	Personyears
FY 1977	$666,000	$237,800	$903,800	47.6
FY 1978	$660,600	$340,000	$1,000,600	53.6

As shown, all anticipated increases in staff will be derived from Safe Drinking Water Act funding. Projections beyond FY 1978 were not available and were considered unapproachable by DEQE staff.

At the municipal level, projections for future growth in water supply positions were also unavailable and had not been approached. No statistical analysis of existing records of certification or growth had been done either, thus the degree of speculation involved in projecting growth was prohibitory.

D. Training and Certification

Massachusetts requires that each corporation, city, town, or district furnishing to the public any drinking water, for which a charge is made, shall have the treatment and distribution of all water under the supervision of a person who has received a certificate issued by the Board of Certification of Operators of Drinking Water Facilities of the Executive Office of Consumer Affairs, Registration Division. It is not necessary for all water works personnel to receive certification; only those who are operators are required to be certified or are eligible for certification. An operator is defined as "the person who has direct responsibility for the operation of a drinking water supply facility."

The following figure presents a detailed classification scheme for water supply facilities in Massachusetts.

Figure 2 COMMONWEALTH OF MASSACHUSETTS

Classification of Water Supply Facilities

	Facilities	Design Population
Class I	Distribution System Only	to 9,999
	Distribution System with treatment using disinfection, and/or stabilizing or corrosion correction chemicals and/or fluoridation and/or softening	Less than 2,000
Class II	Distribution System Only	10,000 to 24,999
	Maintenance of Source and Distribution System with Treatment using disinfection, and/or stabilizing or corrosion correction chemicals and/or fluoridation and/or taste and odor control by chemical or mechanial means and/or softening	2,000 to 9,999
	Iron and/or Manganese removal by oxidation and filtration and/or filtration processes for water quality improvement	2,000 to 9,999
Class III	Distribution System Only	25,000 to 49,999
	Maintenance of Source and Distribution system with treatment using disinfection and/or stabilizing or corrosion correction chemicals and/or fluoridation, and/or slow sand filtration and/or taste and odor control by chemical or mechanical means and/or softening.	10,000 to 24,999
	Iron and/or manganese removal by oxidation and filtration and/or sand or other media filtration involving chemical feeding, flocculation, sedimentation, and chemical and bacterial control.	10,000 to 24,999
Class IV	Distribution System Only	50,000 and over
	Maintenance of source and distribution system with treatment using disinfection and/or stability or corrosion correction chemicals and/or fluoridation and/or slow sand filtration and/or taste and odor control by chemical or mechanical means and/or softening.	25,000 and over

	Facilities	Design Population
Class IV (continued)	Iron and/or Manganese removal by oxidation and filtration and/or sand or other media filtration involving chemical feeding, flocculation, sedimentation, and chemical and bacterial control.	25,000 and over

Operators in Massachusetts are certified "to insure the proper management, operation and maintenance of a drinking water supply facility". The following table describes the requirements for certification of each class of water supply facility. Please note, grade classification schemes for operators and facilities correspond numerically. Additionally, Grade IV operators are the most experienced operators with Grade I operators being the least. No distinction is made between water supply operators or distributors.

Figure 3

COMMONWEALTH OF MASSACHUSETTS
OPERATOR EDUCATION AND EXPERIENCE QUALIFICATIONS

Grade I

a. Two years of high school or equivalent and one year in operation of a drinking water supply facility, or

b. Produce educational qualifications and experience satisfactory to the board of certification and demonstrate ability to operate a drinking water supply facility with limited supervision.

Grade II

a. High school education or equivalent and one year of direct responsibility without substitution, or three years in operation of a drinking water supply facility, or

b. Two years of high school or equivalent and four years of direct responsibility without substitution, or six years in operation of a drinking water supply facility.

Grade III

a. Two years of college (with courses in the physical and/or biological sciences) and three years of direct responsibility without substitution, or five years in operation of a drinking water supply facility of Grade II or higher classification, or

b. High school education or equivalent and four years of direct responsibility without substitution, or six years in operation of a drinking water supply facility of a Grade II or higher classification.

Grade IV

a. A degree of Bachelor of Science in engineering (with a special course in the physical and/or biological sciences) and two years in direct responsibility without substitution, or four years in operation of a Grade III or higher classification of a drinking water supply facility, or

b. Four years of college (with courses in the physical and/or biological sciences) and three years of direct responsibility without substitution, or five years in operation of a Grade III or higher classification of a drinking water supply facility, or

c. High school education or equivalent and six years of direct responsibility without substitution, or eight years in operation of a Grade III or higher classification of a drinking water supply facility.

The following figure presents the grade certificate requirements for operating the various classes of facilities.

Figure 4

COMMONWEALTH OF MASSACHUSETTS

Water Supply Facilities in Massachusetts

Facility Class	Operator Grade Requirements
Class IV	In a Class IV Facility, the person with direct responsibility and having active field supervision of activities must hold a Grade IV Certificate.
Class III	In a Class III Facility, the person with direct responsibility and having active field supervision of activities must hold either a Grade III or a Grade IV Certificate.
Class II	In a Class II Facility, the person with direct responsibility and having active field supervision of activities must hold a Grade II or higher Certificate.
Class I	In a Class I Facility, the person with direct responsibility and having active field supervision of activities must hold a Grade I or higher Certificate.

Certificates are permanent and do not need to be renewed. Operators wishing to obtain a certification for operating a higher grade plant must satisfy all requirements of that particular grade through re-examination and re-certification.

No training is offered by the Commonwealth of Massachusetts which leads to operator certification or upgrade certification. All training must be derived independently. The figure on the following page presents an overview of water supply training programs in Massachusetts.

The New England Water Works Association (NEWWA) has run a number of water works schools for operator certification at the various grade levels in Massachusetts. Courses usually run once per week for three hour sessions (night) and generally last ten weeks.

Due to the obvious lack of extensive operator training in Massachusetts as well as the rest of the states, EPA has developed a comprehensive training strategy for FY 1977 which will most likely impact Massachusetts to a large extent.

Figure 5

COMMONWEALTH OF MASSACHUSETTS
SELECT WATER SUPPLY TRAINING PROGRAMS IN MASSACHUSETTS

Type of Educational Program	Sponsoring Agency	Duration and/or degree
Civil Engineering (Environmental) with emphasis on air, ocean, wastewater, water, solid waste	University of Massachusetts, Amherst	Bachelor of Science/ day
Civil Engineering Technology (emphasis on wastewater systems, water supply, and field work)	Wentworth Institute Boston	Associate in Engineering
Environmental Technology Program (train students for employment in water, air, wastewater, solid waste, and noise abatement)	Northern Essex Community College in Haverhill	Associate in Science/ day
Environmental Technology Program (train students for employment in water, wastewater, and wetlands management)	Essex Agricultural & Technical Institute	Associate in Applied Science
Master of Science in Environmental Studies (emphasis in laboratory, water, wastewater, air, solid waste)	University of Lowell	Later afternoon, evening, Master of Science
Civil Engineering (emphasis on wastewater, water, plant design)	Tufts University, Medford	Bachelor of Science in CE, Master of Science in CE
Environmental Technology (with options in water, wastewater, air, and solid waste)	Springfield Technical Community College, Springfield	Associate in Environmental Technology
Environmental Engineering and Science (emphasis on wastewater, sanitary engineering, lab, water, and plant design)	Worcester Poly Tech.	Bachelor of Science
Civil Engineering (environmental control) with emphasis on wastewater, sanitary engineering, lab, water, and plant design	Worcester Poly Tech.	Bachelor of Science, Master of Science, day or evening
Civil Engineering (emphasis on water, wastewater, soil)	Worcester Junior College	Associate in Science in Civil Engineering

E. Career Potential

Due to the unavailability of workforce projections, career potential is somewhat difficult to ascertain. Generally speaking, however, the Division of Water Supply believes that in order to meet standards and regulations promulgated under the Safe Drinking Water Act of 1974, most chief operators of water treatment plants will need at least two years of technical training to ensure an adequate background for safe and reliable operation. Since municipalities do their own hiring, the demand for new operators is unknown.

At the state level, career potential is also unknown as the future growth/decline of the water supply program is not known at this time.

F. Conclusion

The water supply program of the Commonwealth of Massachusetts is totally dependent on federal funding for any future workforce growth as the program has been ordered by the Governor to effect a ten percent decrease in total state operating expenses over the next four years. Workforce growth/decline is unknown as a result. Composition of certified operators throughout the state is additionally unknown as well as the growth rate associated with water supply personnel. No special statistical analyses have been done by the Board of Certification to determine various trends in its pool of certified operators. Additionally, no training is offered by the state for individuals interested in pursuing a career in the water supply field.

Standards promulgated under the Safe Drinking Water Act of 1974 are, however, likely to increase the need for technical skills necessary for operating compliance. It has been suggested that the basic level of education of supervisory operators will have to be upgraded to satisfy the technical background required for operating under the regulations of the Act. Two years of technical training would be satisfactory and would fulfill all basic needs.

V. RADIATION

A. Introduction

The Massachusetts radiation control program is located within the State Department of Health and is responsible for monitoring and control of the uses of ionizing and non-ionizing radiation as well as power reactors within the state. Massachusetts now has two on-line electirc power generating reactors and three small university reactors at M.I.T. Lowell Institute, and Worcester Polytech. Figure 6 on the following page is included to portray a profile of existing and planned nuclear power facilities within the state. As is evidenced by the figure, there are no nuclear units scheduled to come on-line within the next five years.

B. Workforce Profile

The Radiaition Control Program in the Commonwealth of Massachusetts has the following organizational structure.

MASSACHUSETTS RADIATION CONTROL ORGANIZATION

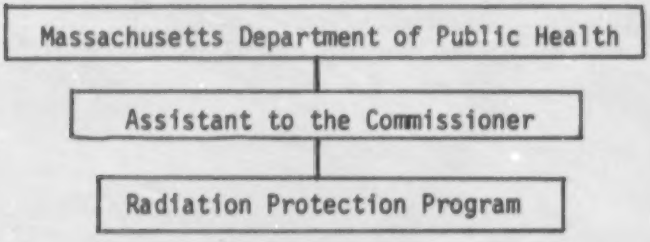


Figure 6

COMMONWEALTH OF MASSACHUSETTS

Massachusetts Nuclear Generating Units
in Operation, under Construction, or Proposed

Site	Plant Name	Utility	Capacity (Megawatts)	Status	Scheduled Operation
Rowe	Yankee Nuclear Power Station	Yankee Atomic Electric Company	175	Operational	1961
Plymouth	Pilgrim Station Unit 1	Boston Edison Company	670	Operational	1972
Plymouth	Pilgrim Station Unit 2	Boston Edison Company	1,180	Under Review	1983
Turner Falls	Montague Unit 1	Northeast Nuclear Energy Company	1,150	Under Review	1986
Turner Falls	Montague Unit 2	Northeast Nuclear Energy Company	1,150	Under Review	1988

Table X is included to depict the current staffing level of the program.

TABLE X

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH

Radiation Protection Program
Current (1976) Staffing Level

Position	1976
Administrator	1
Radiological Health Specialist	3
Chemist	2
X-ray Technician	4
Clerical	3
TOTAL	13

Approximately 4.5 person years of the programs' activities (excluding clerical) are devoted to environmental monitoring, while 5.5 are spent on university/medical monitoring.

C. Workforce Projections

Projections over the next five years are difficult to develop due to the unknown nature of future state and federal support for the program. Within the next two years it is anticipated that the program will add to its staff one nuclear engineer and an additional clerk/typist. Activities should increase in the area of nuclear medicines and non-ionizing consumer products monitoring. Turnover in the program has been negligible.

D. Training and Certification

Training for radiation program employees is limited due to the lack of available resources to finance upgraded and continuing education. The program has participated in courses offered through the Harvard

School of Public Health. The following two course descriptions represent the type of courses available:

Short Course in Basic Radiation Measurement: This 1-week course is designed to meet the requirements of training in the fundamentals of radiation protection for personnel at nuclear facilities, industrial installations, medical and educational institutions, and research laboratories. In-depth coverage will be provided of current radiation protection standards, associated federal laws and regulatory guides, state of the art in laboratory and field monitoring equipment, and radiation-exposure experience, both in-plant and within the environment. Lectures will be presented in the modern facilities of the School of Public Health, and daily laboratory sessions will provide participants with hands-on experience in the calibration and use of laboratory and survey instruments, techniques of personnel dosimetry, and the principles of radiation shielding and protection techniques.

Short Course in Planning for Nuclear Emergencies: This 1-week course provides coverage of standards and guides for emergency action; instrumentation to determine the nature of, and to follow the course of, an accident; interrelationships between nuclear power-plant operators and federal, state, and local agencies; effective countermeasure action; and current research and development in this important subject area. The course is directed primarily to personnel from public utilities, from regulatory agencies, and from law-enforcement, civil-defense, and disaster-control agencies. Sessions will be led by experts actively engaged in nuclear emergency planning and will be conducted in the modern facilities of the Harvard School of Public Health. Lectures will be presented on an informal basis, and ample time will be conducted in the modern facilities of the Harvard School of Public Health. Lectures will be presented on an informal basis, and ample time will be provided for questions and discussion. Attendees will be provided with copies of a variety of publications relevant to the subject matter covered.

In the private sector training offered by program personnel in nuclear facilities is substantial. A typical training program for a nuclear facility would most likely include the courses of study depicted below. This particular schedule of training was utilized by the Boston Edison Company for Pilgrim Unit #2 on Cape Cod.

Basic Mathematics: The course will establish mathematical proficiency in the students at a level necessary to understand the reactor theory required for operator licensing. The course reviews arithmetic and introduces algebra, trigonometry and rate of change calculational methods. Emphasis is placed on the solution of practical problems of the form encountered in Nuclear Theory, Radiochemistry and Radiological Control.

Basic Nuclear Technology: This course consists of approximately twelve (12) weeks academic work at a university with a research reactor available for experimentation and criticality practice. A minimum of ten reactor startups and shutdowns will be performed by each trainee. Reactor experiments demonstrating basic concepts, such as neutron scattering and absorption, period, reactivity coefficients, poison, flux patterns and shielding will relate the academic program to a practical understanding of reactor behavior. The trainees' progress and content of this course will be closely followed. Examinations will be given during the course, and a final grade assigned at the completion of this phase.

Power Plant Observation: The observation period is designed to familiarize the student with the day to day duties at Pilgrim Unit 1. The observation period is divided into two parts, each approximately two months long. During the first part, the students are assigned as observers in each of the shift duty positions on a rotating basis. They will spend the majority of their time assigned to the Nuclear Plant Operator and Chemical Control and Radiation Protection Operator. This maximized their exposure to the detailed duties and responsibilities of these watch stations during plant operations. The second phase of the observation training is conducted after the simulator training segment is completed.

The students are again assigned to various operating shift stations, but spend the majortiy of their time observing the supervisory positions. Because of their background in the duties and responsibilities of the other watch stations and operational experience from the simulator, the students are able to understand problems and evaluate supervisory decisions based on overall plant requirements. A Training Coordinator is assigned for the duration of both phases to provide introductory information on the observation plant and to ensure the most effective use is made of the observation period.

Design Lecture Series: The design lecture series are provided to indoctrinate trainees in the following major subjects:

- Core Mechanical Design
- Reactor Phusics
- Thermal Hydraulics
- Mechanical Systems Design
- Instrumentation Control and Electical Systems Design
- NSSS Response
- Safety Analysis and Technical Specifications
- Operating and Emergency Procedures
- Startup Test Program

The design basis and functional description of the NSS systems and components are presented in detail. Where appropriate to the lecture material, a session is scheduled at the PWR simulator where NSS and Facility operation characteristics are demonstrated. Emphasis is placed on how the system status can be determined from the various instrumentation devices.

Simulator Training Program: Simulator training will be conducted at the Combustion Engineering, Inc. Nuclear Training Facility in Windsor, Connecticut for a two-month period. The simulator will feature at least ten initial conditions for starting operational points. A few of these are cold shutdown, hot standby, 100 percent power, each at various conditions of core age and xenon poisoning. The trainees will receive simulator orientation lectures in order to become familiar with control room features and the operating and emergency procedures for the plant. The response characteristics for the simulator will be programmed to be close to those of the Facility. In this respect, reactor response to disturbances, rod motion, maneuvering transients, etc., will indicate to the trainee what to expect on the plant he will operate, when qualified. During operation where the student controls the plant according to operating procedures, at least 100 emergencies or abnormal situations may be imposed on the plant by the instructor at a remote console. The trainee will then respond to these abnormal conditions, as he would on the actual plant. A printout is made of important parameters on each simulated event against time and operator action. After the training drill is completed, the instructor reviews the event with the student indicating where improvement could be made.

In this fashion, the student learns by doing and is afforded the opportunity to see situations imposed on the plant that could never be done for training purposes in the actual Facility.

On-Site Training: Approximately two (2) years prior to scheduled fuel loading, a will be assigned to direct the training efforts related to operator training. He will be an experienced reactor operations engineer with practical reactor startup and training experience. Lesson plans, training aids, examinations and schedules will be provided. Practical training will result from the participation of Pilgrim Divison personnel in the preparation and conduct of pre-operational and startup tests.

Nuclear Engineering Work Experience: Combustion Engineering, Inc. will provide a three-month experience program at the Windsor headquarters to develop experience for selected technical personnel in nuclear engineering and reactor operations. Personnel will work directly with experienced reactor engineering, startup and reactor operations personnel developing startup test procedures, fuel loading operations, physics and power test programs and methods of data reduction and analysis.

Radiochemistry Training: Combustion Engineering, Inc. will provide a training course to ensure that selected trainees are experienced in radiochemical separation techniques as they apply to the analysis of reactor coolant fission and corrosion products and environmental samples. The training course will be presented at the Nuclear Training Facility over a two-week period by experienced radiochemists. Approximately twenty (20) hours of formal lectures will be given and the remainder of the time will be spent gaining practical experience and conducting analysis in the laboratory. At all times qualified instructors will supervise the laboratory training. In order to complete the course, the students must be experienced in classical chemistry and laboratory techniques.

Instrumentation and Control Training: Combustion Engineering, Inc. will provide a course in instrumentation and control for selected trainees. The training course will be presented in various segments will have a total duration of approximately eight weeks. Experienced design and operations engineers will discuss system functional requirements; analyze, in detail, component and system wiring diagrams, and provide practical instruction in installation, maintenance, trouble-shooting and system operation. Approximately one-half of the total time will be spent with formal lecture presentations and the remainder devoted to practical instruction on actual system equipment. About one week of the latter portion will be presented on-site after equipment installation. The remainder of the course will be presented at Combustion Engineering, Inc. or subvendors' facilities.

Radiaiton Safety Training: All Facility personnel will be given a radiation safety course at the site. The course is designed to provide the basic fundamentals of radiation protection methods for radiation workers. This course covers the basic introduction to atomic particles, definition of units used in radiation work, descriptions of protection methods, mechanisms for controlling radiation and contamination, methods of estimating radiation exposure, and methods for measuring radiation. The radiation measurement portion of this course is not intended to be a detailed course in radiation monitoring, but should give the student sufficient familiarity with survey instruments so that he may make simple, routine measurements and will know when to call for monitoring assistance from the Health Physics personnel.

The Bechtel Construction personnel at the site for Unit 2 construction will be given instruction in radiation protection, access control procedures and evacuation procedures, as Unit 1 will be in operation during the construction of Unit 2. The instruction will include the radiation hazards associated with specific areas at the site and the precautions to be taken when working in those areas.

E. Career Potential

Career potential in the Radiation Program in Massachusetts will be limited to the field of nuclear physics. Additionally, it is speculative, but possible, that as a result of new consumer products such as microwave units, TV's, security systems, and supermarket checkout scanning lasers (all of which pose significant non-ionizing radiation problems). There could exist a demand for researchers as well as technical monitors if legislation is enacted within the state to regulate and control the radiation emitted by these by these products.

F. Conclusion

The Radiation Program of the Commonwealth of Massachusetts is staffed by 10 professionals engaged in monitoring all uses of ionizing and non-ionizing radiation throughout the state. Over the next two years it is expected that this staff will grow by 2 professionals. The growth/decline of the three year period thereafter is unknown. Areas of non-ionizing radiation monitoring, such as consumer products, should continue to develop and should eventually result in a demand for careers in research and monitoring of these presently unregulated devices.

With the quickened pace of nuclear power development in New England, demand will increase for radiation control professionals and technicians in the early 1980's.

VI. SOLID WASTE

A. Introduction

The Bureau of Solid Waste Disposal (BSWD) is located in the Department of Environmental Management of the Massachusetts Executive Office of Environmental Affairs (EOEA). The Bureau is authorized to plan and implement solid waste disposal systems in Massachusetts pursuant to Chapter 16, Section 18 through 24A of its General Laws. Although regulatory responsibilities are charged to the Division of Environmental Quality Engineering under EOEA, the Bureau of Solid Waste Disposal is considered the primary planning group for solid waste management in Massachusetts. The following program summary was provided by the Director of BSWD.

> The BSWD has recommended a solid waste management plan for Massachusetts that involves a network of regional solid waste systems. The regional systems would be planned and implemented by the BSWD jointly with voluntary groups of municipalities. Proposed regional systems will provide for long term solutions to the solid waste disposal problem through privately owned and operated facilities to process and dispose of refuse. The systems will be environmentally sound, economically competitive, and will maximize the recovery and utilization of resources found in refuse. Systems will be designed to handle refuse from municipal, commercial and industrial sources.
>
> Current regional projects:
>
> Northeastern Massachusetts (Resource Recovery Facility)
> West Suburban Boston (Resource Recovery Facility)
> Worcester Area (Resource Recovery Facility)
> Springfield Area (Resource Recovery Facility)
> New Bedford Area (special waste study)
>
> Other related activities:
>
> Residue utilization study
> Hazardous Waste Management Legislation
> Waste Reduction Programs
> Recycling Programs
> Inter-agency coordination

BSWD Budget:

FY 1976 expenditures	- $469,292
FY 1977 appropriation	- $346,000
FY 1978 agency request (level funding)	- $346,000
FY 1978 Secretary's recommendation	- $406,000

The objective of Massachusetts' solid waste management plan is to maximize recovery of resources from all solid wastes in an economic and environmentally sound manner. The state will act as a coordinator for communities and the private sector in establishing effective solutions integrating processing, transportation, and final disposal. In achieving an overall resource recovery solution, the state will attempt to integrate to the maximum extent possible those resource recovery plants currently in existence.

The Massachusetts solid waste management plan is a state sponsored program to develop a network of regional solid waste management systems. The regional systems will be designed to manage solid wastes in an environmentally sound manner, maximize resource recovery, and minimize waste disposal through the reutilization of the energy and materials. System costs will be partially offset by revenue from recovered resources so that net costs will be competitive with alternative environmentally acceptable disposal practices.

The statewide network of regional systems will be designed to provide full solid waste management and disposal services. In addition to general processable wastes, the system will provide for the reuse or sound disposal of unprocessable wastes, process residues, special wastes, and hazardous wastes.

The recommended statewide plan is being sponsored, administered, and regulated by the state Executive Office of Environmental Affairs through its Departments of Environmental Management (DEM) and Environmental Quality Engineering (DEQE). DEM through its Bureau of Solid Waste Disposal is responsible for the planning, organization, implementation, and administration of the program.

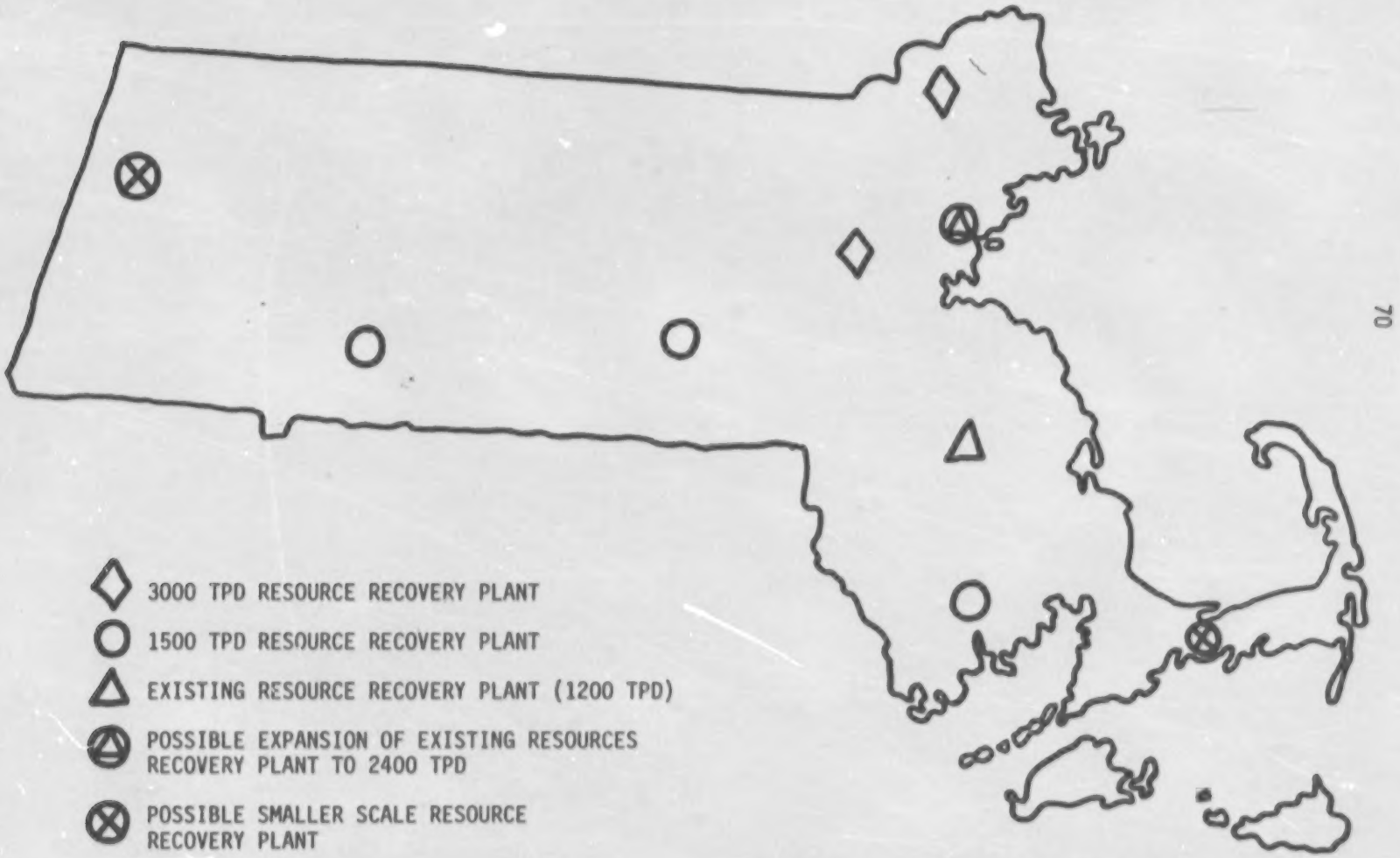
The implementation of the state program is a combined effort of the public and private sectors. Each element of the program is the responsibility of the party or parties best suited to carry out the function effectively and efficiently. The expertise and experience of the private sector in designing, constructing and operating solid waste facilities is being fully utilized.

Concurrent with statewide regional efforts to reutilize or properly dispose of solid wastes, the state management plan involves the encouragement and support of efforts on national, state and local levels to reduce waste generation and to reuse materials prior to their becoming part of the solid waste stream, as now called for by the Resource Conservation and Recovery Act of 1976 (PL 94-580).

The following map is included to portray the long term scheme of resource recovery facility site location within Massachusetts. Included are projected tons per day (TPD) capacities for the larger plants which will make up the backbone of the system in urban/suburban areas. Additionally, proposed smaller resource recovery sites for more rural areas are included in this statewide overview.

Figure 7

PROPOSED RESOURCE RECOVERY PLANT LOCATIONS IN MASSACHUSETTS


3000 TPD RESOURCE RECOVERY PLANT
1500 TPD RESOURCE RECOVERY PLANT
EXISTING RESOURCE RECOVERY PLANT (1200 TPD)
POSSIBLE EXPANSION OF EXISTING RESOURCES RECOVERY PLANT TO 2400 TPD
POSSIBLE SMALLER SCALE RESOURCE RECOVERY PLANT

The following figure portrays the current projected timelines for on-line establishment of the proposed and actual resource recovery facilities in Massachusetts.

Figure 8

COMMONWEALTH OF MASSACHUSETTS
RESOURCE RECOVERY FACILITY IMPLEMENTATION SCHEDULE

PRIVATELY SPONSORED

Saugus - 1200 TPD	1976
2400 TPD	1978
East Bridgewater - 1200 TPD	1976

STATE SPONSORED

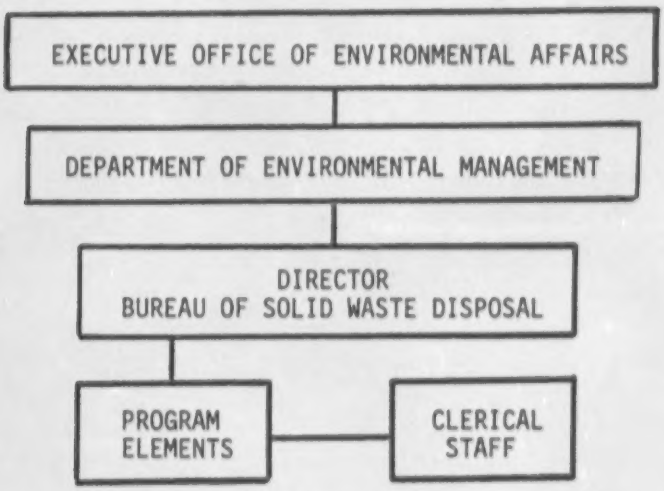
Northeastern Mass. - 3000 TPD	1979
West Suburban - 3000 TPD	1980
Springfield - 1500 TPD	1981
Worcester - 1500 TPD	1981
New Bedford - 1500 TPD	1982

As can be seen, two major facilities are currently operational, one in East Bridgewater and one in Saugus, both privately sponsored and operated. The schedule shows that by 1982 five additional state sponsored facilities should be on-line processing wastes from the primary urban/suburban areas within the state. It is estimated that upon final implementation, four and one half percent of the total electrical generating capacity of Massachusetts will be recovered. This equates to approximately 4,000,000 barrels of oil per year.

B. Workforce Profile

The Massachusetts Bureau of Solid Waste Disposal has the following organizational structure.

MASSACHUSETTS BUREAU OF SOLID WASTE DISPOSAL ORGANIZATION



As shown, the office is located within the Department of Environmental Management of the Executive Office of Environmental Affairs. It is currently staffed by nine individuals in addition to a Bureau Director. The following table depicts a current breakdown of employees in the program.

TABLE XI

MASSACHUSETTS EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS

Department of Environmental Management
Bureau of Solid Waste Disposal
Current (1976) Staffing Level

Position	1976
Director	1
Assistant Director	1
Administrators (Planning)	2
Engineers*	3
Clerical	3
TOTAL	10

* One engineer is on loan from EPA Region I

For 1976 there exist 15 executively authorized positions; however, as shown, only nine are filled and the remainder will not be filled due to an existing political conflict between the State Legislature and the Executive Branch (the nature of which is indeterminable).

The current workforce employed by the municipal and private sectors in resource recovery is unknown. At this time, however, the extent of involvement is considerable. Current emphasis is being placed upon source separation and separate collection activities within the state. Currently the towns of Marblehead and Sommerville are both operating municipal separate collection solid waste programs under demonstration grants from EPA. The purpose of these two projects is to determine whether or not two model communities (suburban and urban) can economically recover recyclable materials from their waste streams. Participation is voluntary and is about 30 percent in Marblehead and ten percent in Sommerville.

C. Workforce Projections

The FY 1977 program objectives for the Bureau of Solid Waste Disposal are tentatively as follows:

ENCOURAGEMENT OF RECYCLING AND REUSE THROUGH INFORMATION AND REFERRAL

I. Support recycling and reuse of solid waste

A. To encourage, assist and support efforts at federal, state and local levels to reduce solid waste and maximize resource utilization.

1. Encourage and assist municipal recycling programs;
2. Encourage state recycling activities;
3. Study and encourage state procurement potential for recycled materials;
4. Support federal efforts to reduce waste;

II. Special waste management

A. To provide an environmentally sound alternative to handling, storing, and disposal of special waste materials.

SITE SELECTION, CONTRACTOR SELECTION AND INITIAL MUNICIPAL PARTICIPATION AGREEMENTS

I. Regional resource recovery projects

A. To provide an environmentally and economically sound alternative waste disposal method for municipal, commercial, and industrial solid waste

1. Northeastern Massachusetts Project: Commence construction
   a. Complete contract negotiations,
   b. Complete transportation and landfill arrangements,
   c. Secure municipal participation contracts,
   d. Secure facility financing,
   e. Complete EIR requirements and secure permits,

2. West suburban Boston area project: System contractor selection and contract negotiation.
   a. Complete site evaluation and selection,
   b. Issue request for proposals to private industry,
   c. Evaluate proposals and select system contractor,
   d. Negotiate contract,
3. Worcester area project: System contractor selection
   a. Site evaluation and selection,
   b. Issue request for proposals to private industry,
   c. Evaluate proposals and select system contractor,
4. Springfield area project: System contractor selection
   a. Site evaluation and selection,
   b. Issue request for proposals to private industry,
   c. Evaluate proposals and select system contractor,

II. Coordinate solid waste management program with solid waste regulation and enforcement programs of DEQE.

A. To coordinate state solid waste activities in order to assure an orderly transition from historical municipal disposal practices to regional resource recovery systems.

1. Coordinate management and enforcement priorities;
2. Improve interdepartmental communication and information exchange;
3. Utilize federal support to supplement the capabilities of management and enforcement staffs;
4. Obtain regulatory approval of regional project activities through appropriate permit application;
5. Involve regulatory participation in site selection and system contractor selection;

The aforementioned objectives represent an optimum program level concurrent with an initial budget request of $406,000 during the initial preview stage for FY 1977 activities of BSWD. Additionally, this strategy would have resulted in an increase of the current staffing level of nine full time employees to a level of 14 or 15. However, the state legislature reduced the agency request to $346,000 with a permanant reduction in authorized personnel from 15 positions to seven. This decrease represents a 50 percent reduction in authorized personnel within a year's time which could potentially result in a reduction and/or revision of the Bureau's goals and objectives.

TABLE XII

MASSACHUSETTS EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS

Department of Environmental Management
Bureau of Solid Waste Disposal
Workforce Projections

	FY 1976 (actual)	FY 1977 (Budget request)	FY 1977 (Legislative authorizations)	FY 1977 (Probable)
Current Positions	9	15	7	9
Authorized Positions	15	15	7	?
Budget	$469,292.	$406,000.	$346,000.	?

The status of positions and staffing remains unresolved at this time. Projections beyond FY 1977 are obviously impossible to make for the program. The ability of BSWD to meet the FY 1977 objectives previously outlined will be determined by whether or not amendments can be made to the FY 1977 legislative authorizations. At this time the matter is still unresolved. The program staff feel that rather than jeopardize the current state strategy, it will attempt to provide all necessary municipal assistance with whatever resources actually become available. If a proposed decrease

in program authorization becomes established, then the goals and objectives outlined for FY 1977 will not proceed as anticipated by this strategy. Only total municipal cooperation and initiative will keep all activities on schedule. Priority and level of effort, however, will continue for the Northeastern Resource Recovery Facility (Haverhill, Massachusetts) while other proposed projects will proceed as time permits.

Projections for the next five year period for the private sector in resource recovery and related activities are not available at this time due to the tenuous implementation schedule for the state's facility construction strategy. It is believed, however, that this sector will impact about 80 percent of the entire workforce with municipal employees charged solely with responsibilities in collection and hauling.

D. Training and Certification

Formal state sponsored training and certification activities for BSWD personnel are currently nonexistent. Individuals, however, do avail themselves of EPA Region I sponsored workshops and seminars, and, owing to their proximity to Region I's headquarters, technical assistance and interaction could be considered above what is available to most New England state solid waste programs more distant from Boston. Assistance and training offered to local communities in resource activity implementation is quite extensive in the following areas:

1) Municipal recycling programs
2) Inter-municipal cooperation
3) Municipal waste reduction programs
4) Informational brochures and presentations for municipal officials on the benefits of resource recovery
5) Municipal sessions on contract and transporation negotiations

In the private sector, all resource recovery facility training will be provided for by the contractor/operator. Figures and/or courses are not available concerning the in-house capabilities of current or potential contractors.

Future training activities of the Massachusetts Bureau of Solid Waste Disposal could be quite extensive due to the comprehensive nature of the Resource Recovery and Conservation Act of 1976. At this writing, however, explicitly defined state programs have not been approached. It is more than likely that the major thrust of any EPA sponsored training will be directed towards state and local agencies as provided for under PL 94-580. Specifically, Section 7007 of the Act authorizes EPA to make either grants or contracts with state solid waste programs, interstate solid waste agencies, municipalities, and educational institutions, as well as private organizations to develop and implement training programs to train individuals for occupations in solid waste management. Additionally, funds will also be made available to train instructors and supervisory personnel to train or supervise manpower involved in solid waste disposal and resource recovery.

E. Career Potential

Career potential in BSWD's program is indeterminable due to the nature of future workforce growth or decline. PL 94-580 could possibly impact the program's hazardous waste plan through federal assistance; however, at this stage impact beyond FY 1977 is unknown.

Concurrently, in the private sector resource recovery career development is totally dependent on timelines associated with facility development. Due to the fact that the private sector is efficient in collection

and systems operation, most operation and maintenance work will be under contract to provide cost competitive markets. The following areas of likely career potential at both the private and municipal levels, as shown in Figure 9, has been projected by BDWD. However, a scheduled rate or dimension of career potential is unavailable.

Figure 9

COMMONWEALTH OF MASSACHUSETTS
Areas of Career Potential for
Resource Recovery Related O&M Employment

Function	Sponsor	Area of Career Potential
Collection	Community	Community/private
Packer haul	Community	Community/private
Transfer station operator	State*	Private
Transfer haul	State*	Private
Resource recovery plant	State	Private
Product haul	Private	Private
Residue haul	Private	Private
Residue storage/disposal site	State	Private
Emergency landfill	State	Private
Demolition landfill	State/community	Community/private

*State would be sponsor of transfer station and haul contracts when transportation costs are shared by all participating communities. Sharing of transporation costs are encouraged to achieve benefits of economies of scale. The alternative, if transportation sharing does not occur, is to assist communities in planning and financing transfer station but only transfer station participants would share costs.

Finally, it is hoped that through the above arrangement the innovative private-public partnership will capitalize on private efficiency while maintaining public control.

F. Conclusion

The statewide plan for resource recovery facility development appears to be aggressive, but perhaps politically unacceptable due to the state legislature's questionable commitment to providing for an adequate state program. Future prospects appear uncertain at this time in both manpower development as well as statwide program objectives. Additionally, the director of BSWC who was instrumental in developing Massachusetts' strategy for a statewide solid waste management program, has resigned.

The politically sensitive aspect of this program will most likely be the determining and/or limiting factor for satisfaction of the proposed resource recovery facility construction program. Due to the heavy public control which is held by BSWD over implementation, it appears as if future resource recovery workforce related growth will be a function of its success in maintaining current timelines. At this time no workforce projections can be approached.

The impact of PL 94-580 is also questionable at this time. The most signficant impact of this new law will take the form of aiding Massachusetts in developing a thorough statewide hazardous waste management program. As Massachusetts has exhibited a proficiency in resource conservation and recovery, the impact of this section of the Act will most likely not be as extensive as it will be in states with no such programs in existence. Massachusetts, in this case, would be used as a model for other states, after which they might pattern their own program.

VII. WASTEWATER

A. Introduction

The Division of Water Pollution Control (DWPC), in the Department of Environmental Quality Engineering, is the Massachusetts agency concerned with the management of wastewater treatment facilities. This Division distributes construction grant funds to the cities and towns of the state by authority of the Federal Water Pollution Control Act (FWPCA). Funding offered under this program currently provides 75 percent of the total cost of constructing municipal wastewater treatment plants, interceptor sewers, and pumping stations. The remaining 25 percent is financed by the state and local governments usually in the form of a 15 percent state match and a 10 percent local contribution.

The Division of Water Pollution Control has as its goal the attainment of a level of water quality in Massachusetts by 1983 that will protect aquatic life and be clean enough for swimming and other recreational uses. FWPCA requires Massachusetts to achieve this goal through a two-phase approach. The first phase, to be completed by July 1, 1977, requires that industry use the best practicable technology to control pollution, and that public treatment plants provide at least secondary treatment. By the completion of the second phase on July 1, 1983, Massachusetts industry must use the best available technology, and public facilities must provide the best practicable technology for water pollution control.

FWPCA is administered by EPA and Massachusetts through two programs provided by the act - a construction grant program and a discharge permit program. The construction grant program, as previously mentioned, provides funds for the construction of municipal wastewater treatment facilities. Prior to awarding a community funding to initiate such a facility, the application must be reviewed for both design and specifications.

As can be seen in the following chart, Massachusetts had obligated only 57 percent of available funding under FWPCA one year before the scheduled deadline of September 30, 1977. It has been estimated that the monies obligated so far have created some 7,000 engineering and construction jobs as well as 800 permanent jobs involved in the operation and maintenance (O & M) of these new facilities. With a substantial amount of funding to be obligated within the next year, professionals have judged that an additional two to three thousand engineering and construction jobs will be created. Of course it should be mentioned that many of these jobs do not necessarily reflect a comparable level of the workforce as many individuals may be involved in more than one project.

Figure 10

COMMONWEALTH OF MASSACHUSETTS
CONSTRUCTION GRANTS PROGRAM STATUS
FUNDING AS OF JANUARY 1, 1977

State	Funds Authorized (Millions)	Funds Obligated (Millions)	Funds Remaining* (Millions)	Percent Remaining (%)
Massachusetts	573.9	325.9	248.0	43%

* Deadline for obligating these funds is September 30, 1977

The other major program under FWPCA is the National Pollutant Discharge Elimination System (NPDES), a permit program to regulate the amount of pollutants discharged into the waters. DWPC, together with EPA, has the responsibility to set standards for the effluent limitations or the maximum amount of pollutants that can be discharged into a body of water. While sources of this pollution such as municipal waste treatment plants and industrial plants must monitor and report on the waste discharged, DWPC and EPA have the authority for the issuance and enforcement of the permits.

The Division of Water Pollution Control has authority over industrial and municipal discharges to guarantee water quality standards within the state. It also certifies all activities in the state's waterways to ensure that water quality standards are not disrupted. The division is the foremost agency concerned with oil, oil spills, and oil clean-up operations in the Massachusetts marine environment.

B. Workforce Profile

The Massachusetts wastewater program is in the Executive Office of Environmental Affairs and has the organizational structure as seen on the following page.

As shown, the Division of Water Pollution Control is presided over by the Water Resources Commission which is an eleven member board charged with review and approval of DWPC's activities. Unlike DEQE's Division of Air and Hazardous Materials, regional environmental offices do not have authority over water pollution control. They act only as extensions of

MASSACHUSETTS WASTEWATER PROGRAM

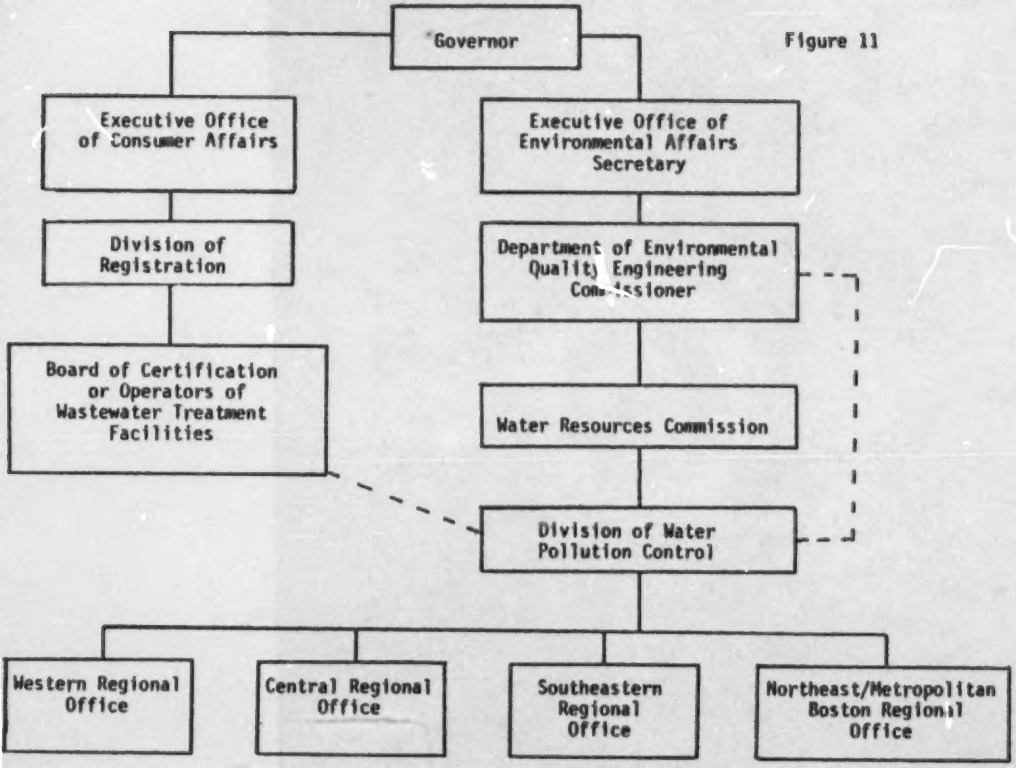

Governor
Executive Office of Consumer Affairs
Executive Office of Environmental Affairs Secretary
Division of Registration
Department of Environmental Quality Engineering Commissioner
Board of Certification or Operators of Wastewater Treatment Facilities
Water Resources Commission
Division of Water Pollution Control
Western Regional Office
Central Regional Office
Southeastern Regional Office
Northeast/Metropolitan Boston Regional Office

Figure 11

DWPC and must report to them. The certification of all wastewater treatment operators in Massachusetts is conducted by the Board of Certification of Operators of Wastewater Treatment Facilities which works closely with DWPC.

The following table depicts the Division of Water Pollution Control Staffing Level.

TABLE XIII

MASSACHUSETTS EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS

Department of Environmental Quality Engineering
Division of Water Pollution Control
Current (1976) Staffing Level

Position	1976
Administrative	7
Engineer	
Sanitary	47
Civil	4
Biological	1
Lawyer	2
Planner	5
Chemist	2
Biochemist	4
Aquatic Biologist	1
Accountant	3
Senior Sanitary Engineering Aide	
Full-time	1
Seasonal	12
Lab Technician	3
Clerical	19
TOTAL	111

At the local level there exist approximately 600 wastewater treatment plants in the state. These facilities are graded from a level of I, simple design and operation, to a level of VII, complex design and operation. Concurrently, operators in the state are issued classification certificates from grades I to VII with no examination requirements for Grade I (see training and certification section). No statistics were available for the number of operators or the number registered in each certificate level. However, it was estimated that larger plants in the state generally possess 3 certified operators and operate 24 hours per day.

The Massachusetts Department of Water Pollution Control has received $1,547,835 from EPA to support its water pollution abatement and control effort for 1976. These funds are being used to assist the state in establishing and maintaining adequate measures for the prevention and control of water pollution through:

1) Planning,
2) Surveillance,
3) Enforcement,
4) Training,
5) Assistance to legal agencies.

C. Workforce Projections

Specific five-year growth estimates for the Division of Water Pollution Control are beyond the realm of speculation due to the unknown nature of future growth/decline of both federal and state funding sources. However, spokesmen for the program suggest that the workforce is likely to increase to accept additional delegations of authority under FWPCA.

During the past year DWPC was the only environmental program in the Executive Office of Environmental Affairs to grow. The reasons for this unusual circumstance emanate from the fact that the construction grant program generates jobs which is the foremost priority and goal of the present administration. It is projected that two to three thousand engineering and construction jobs will be created through the expenditure of the remaining 248 million dollars by October 1977.

The industrial sector will most likely not experience any workforce growth as they are generally in compliance with existing effluent standards. It is also expected that the number of NPDES permits will remain static.

Finally the operator workforce is expected to grow at the rate of 300-350 new entries per year. Operators desiring to upgrade their certification levels are also expected to increase at a similar pace. No operator workforce attrition rates are available.

D. Training and Certification

The need for adequately trained wastewater treatment plant operators is paramount to ensure proper operation and maintenance (O & M). Presently, every major plant in Massachusetts is inspected at least once per year, and where necessary, plant operations are corrected. The operators are instructed by an EPA operation and maintenance engineer, as well as one state engineer, in proper procedures for plant operation. Assistance of this type has occurred at over seven plants in the region and has resulted in the development and implementation of formal O & M technical assistance programs by Massachusetts.

Figure 12

SELECTED WASTEWATER TRAINING PROGRAMS IN MASSACHUSETTS

Courses Offered	Sponsoring School
Environmental Science (emphasis on sanitary engineering, chemistry of air, water, ecological methods, and land-use planning)	Greenfield Community College Greenfield, MA
Environmental Technology Program (train students for employment in water, wastewater, and wet-lands management)	Essex Agricultural and Technical Institute Essex, MA
Massachusetts Division of Water Pollution Control, Basic and Advanced Wastewater Treatment Plant Operator Training	University of Lowell Lowell, MA
CETA Wastewater Treatment Plant Operator Training Program	Springfield Technical Community College Springfield, MA
Environmental Technology (with options in water, wastewater, air, and solid waste)	Springfield Technical Community College Springfield, MA
Occupational Safety and Health Short Courses, Maintenance Course for Wastewater Treatment Plant Personnel	Springfield Technical Community College Springfield, MA
Environmental Engineering and Science (emphasis on wastewater, sanitary engineering, lab, water, and plant design)	Worcester Poly Tech. Worcester, MA
Environmental Science (emphasis on land, air, water)	Worcester Poly Tech. Worcester, MA
Civil Engineering (emphasis on water, wastewater, soil)	Worcester Junior College Worcester, MA

A survey of wastewater training programs in Massachusetts, conducted by the Water Programs Manpower Office of Region I, is included to provide an overview of various levels of formal training being offered in the state. The figure included on the previous page lists this information by type of program and sponsoring school. Also, EPA funds a six week program addressing process control techniques for wastewater treatment plant operation. Additionally, the agency provides support training programs in laboratory testing techniques.

Wastewater operator training summaries are shown in the following tables.

TABLE XIV

COMMONWEALTH OF MASSACHUSETTS

Wastewater Operator Training Summaries

Preparatory Courses

Respondent	
No. of Institutions	1
No. Students/Year	150
Course is specific for Operator	YES
Course if for general environmental Tech.	
Can material be used in continuing education	YES

Continuing Education

Basic	
No. Courses/Year	2
No. Students/Year	40
Advanced	
No. Courses/Year	1
No. Student/Year	20
Location	
Central	X
Regional	
All Areas	
Credits	
Academic	
CEU	NO
Other	
Financial Support	P

P - public funds through appropriations to agency.

TABLE XV

COMMONWEALTH OF MASSACHUSETTS

Wastewater Operator Training Summaries

Seminars	
No. Courses/Year	2
No Students/Year	200
What Credit	
Correspondence Courses	
What Courses	SC
Who Administers	S/R
No. of Students	100
Self Instruction	
Type of Instruction	
Who Supervises	
No. Participants	
Operator Training Required	
New Entries	300+
Upgrade	300+
Level of Expenditures (in 1000s)	
1975	
1976	
Really Needed	MORE

Correspondence Courses

SC - Sacramento State University

Who Administers CC's
S - supervisor
R - regulatory agency

Source for the tables: Roles and Responsibilities for Developing a Comprehensive State Water and Wastewater Operator Training Program. Association of Boards for Certification for Operating Personnel in Water and Wastewater Utilities (ABC); July 1976.

To summarize this training section, DWPC would like to see EPA open up the Cincinnati Training Center again to a level and variety of courses which would truly meet the expanding educational needs of those currently employed by DWPC. A lot of excellent operator training is available in Massachusetts; however, training directed towards state employee needs is less than it should be. Finally, DWPC is proposing to construct an advanced waste treatment facility to serve as both a state and regional training research center for training new operators and upgrading existing operators in the fundementals of operation and maintenance. This new facility will likely be funded by Section 109 money of the Federal Water Pollution Control Act, as amended.

E. Career Potential

The greatest potential for future employment over the next five years will occur at the municipal level. The construction grant program has had its greatest impact on this sector; and, with the increased number of wastewater facilities in operation (including industrial pretreatment facilities), as well as an increased level in complexity of operation of these plants, the demand for technically competent operations and maintenance personnel will continue. In the private sector, on-site construction-related careers will continue to develop over the duration of facilities construction, most likely through the end of this decade. Additionally, indirect employment from this federal grant program should provide sustained career opportunities for engineering consultants and other contractual professionals as a result of the increase in facility numbers and complexity.

F. Conclusion

The following article provided by EPA Region I with comments by DEQE commissioner summarizes the wastewater-related employment scenario for Massachusetts over the next 5-10 years.

The Boston Harbor Clean-up

The Environmental Protection Agency and the Commonwealth of Massachusetts have finalized agreements on a long range water clean-up program for Boston Harbor and the Neponset and Charles Rivers. The program, which will be carried out over the next ten years at an estimated cost of $850 million, is the most ambitious ever planned in New England. The clean-up program is contained in a joint federal-state permit signed by EPA and the Massachusetts Division of Water Pollution Control.

David Standley, Commissioner of Environmental Quality Engineering for the state, pointed out that once completed, the project will make Boston Harbor one of the cleanest metropolitan waters in the eastern part of the country. "This clean-up effort will coincide with continuing efforts by the Dukakis administration to develop the Boston Harbor Islands for greater public use. This investment will certainly enhance the recreational opportunities of these important waterways," Commissioner Standley noted. The program will be funded by federal grants for 75 percent of the program; fifteen percent is expected to be financed by state grants; and the balance by the 43 communities served by the Metropolitan District Commission (MDC).

Commissioner Standley noted that he is hopeful that the projects can proceed on schedule. "This is one of the state's major public works programs. In addition to the obvious environmental benefits, the program will provide a significant boost to the construction industry in the area. It is estimated that this clean-up program will result in some 17,000 person years of on-site construction jobs over the next decade, plus thousands of person years of off-site jobs," Commissioner Standley added.

As shown the major impact of wastewater expenditures or employment will be in the private construction industry. Impact on the operator workforce will be a function of on-line dates, number of plants, and size and complexity of their operation.

VIII. ENERGY

A. Introduction

Energy for the future at an acceptable price is a major concern of the people and government of Massachusetts. Massachusetts' energy usage is typical of that of the northeastern part of the country. As such, energy needs, especially for heating, greatly exceed the national average. Thirty-five percent of Massachusetts' energy consumption is for space heating; 18% is the national average. Furthermore, although the northeastern region produces more electricity than it uses, it is severely limited in energy resources.

High hopes are placed on locating and developing economically competitive coal deposits in the Narragansett Basin. Massachusetts has adopted a policy to solicit and attract off-shore oil drilling and support services to the state. Discussions have been held with Venezuela in the hope of achieving direct oil sales and perhaps establishing a refinery for Venezuelan oil in Massachusetts. The state is encouraging the development and installation of solar heating equipment with expectations that 30-50% of new buildings can be fitted with solar units and that a solar industry may develop.

Solid waste energy conversion facilities are being planned. The first of three large facilities is to be built to serve the Haverhill area and will generate electric power on site. Several small facilities are being considered. Four to six percent of the public utilities' electrical power generation capacity for Massachusetts is expected to be met by refuse derived fuels by the mid-1980s.

The short term energy goal for Massachusetts is increased energy efficiency. Extensive consumer education efforts have been implemented toward this end. Programs to encourage and promote construction and use of energy efficient commodities have been developed. The following is a list of pending energy legislation for Massachusetts.

ENERGY RELATED LEGISLATION PENDING IN THE GENERAL COURT OF MASSACHUSETTS

Governmental Agencies, Departments

S-402 Would establish an Office of Energy Planning

H-4220 Would establish municipal light plants, setting up an eminent domain procedure whereby the Department of Public Utilities would act as arbitrator in establishing a price for a city or town to buy the existing electrical distribution system from a private company

H-4226 Relating to the powers and duties of the Energy Facilities Siting Council, for regulation of oil facilities in the Commonwealth. To make the law more reflective of the difference between the oil industry and the electrical utility industry, and to eliminate the demand for forecasts from oil companies

S-808 Would regulate Massachustts coal mining

Alternate Energy Sources

H-4316 Encourages development of solar energy by requiring: the Office of Economic Affairs to determine whether solar technology was adequately considered when reviewing environmental impact analyses; the Office of Communities and Development to develop and publicize information on solar heating and cooling systems, and to develop buildings with regulations to facilitate construction of buildings with such systems; the Department of Public Utilities to review rates to be charged to owners of facilities incorporating solar heating or cooling systems; Attorney General to study property rights on operation of solar heating or cooling systems

S-1004 Would require Administration and Finance to have estimates taken for solar energy use for all state construction

Consumers

S-65 Would prohibit the sale of stoves, ovens, ranges and clothes dryers fueled by natural gas and equipped with a pilot light which operates while the unit is not in use

H-3947 Would provide protection for homebuyers and homeowners by requiring sellers of new housing units to disclose the estimated energy operating costs for that unit over a twenty year period

S-1111 Would establish a differential scale for the sales tax on automobiles, with a higher rate for cars using much gasoline, and a lower rate for energy efficient cars

H-3871 Would require that persons conducting ocean exploration for oil be required to transmit certain notices to the Office of Coastal Zone Management and to the Chief Executive Office of the municipality in which the development is to occur

H-1380 Would provide for right turn on red lights

S-378 Would protect the franchise rights of those leasing retail gasoline stations from arbitrary cancellations by major oil companies

Massachusetts Energy Agencies

The Energy Policy Office is an executive office established to advise the Governor, provide coordination among state agencies regarding outer-continental shelf oil development, and to develop energy conservation programs.

Activities of the Energy Policy Office include:

1) participation in the New England Energy Management System;

2) provision of assistance to the Energy Facilities Siting Council (discussed below);

3) development of programs relative to house insulation, commercial buildings, state facilities, transportaion, and utilities;

4) studies regarding off-shore drilling and ports; and,

5) investigation of potential public ownership of utilities.

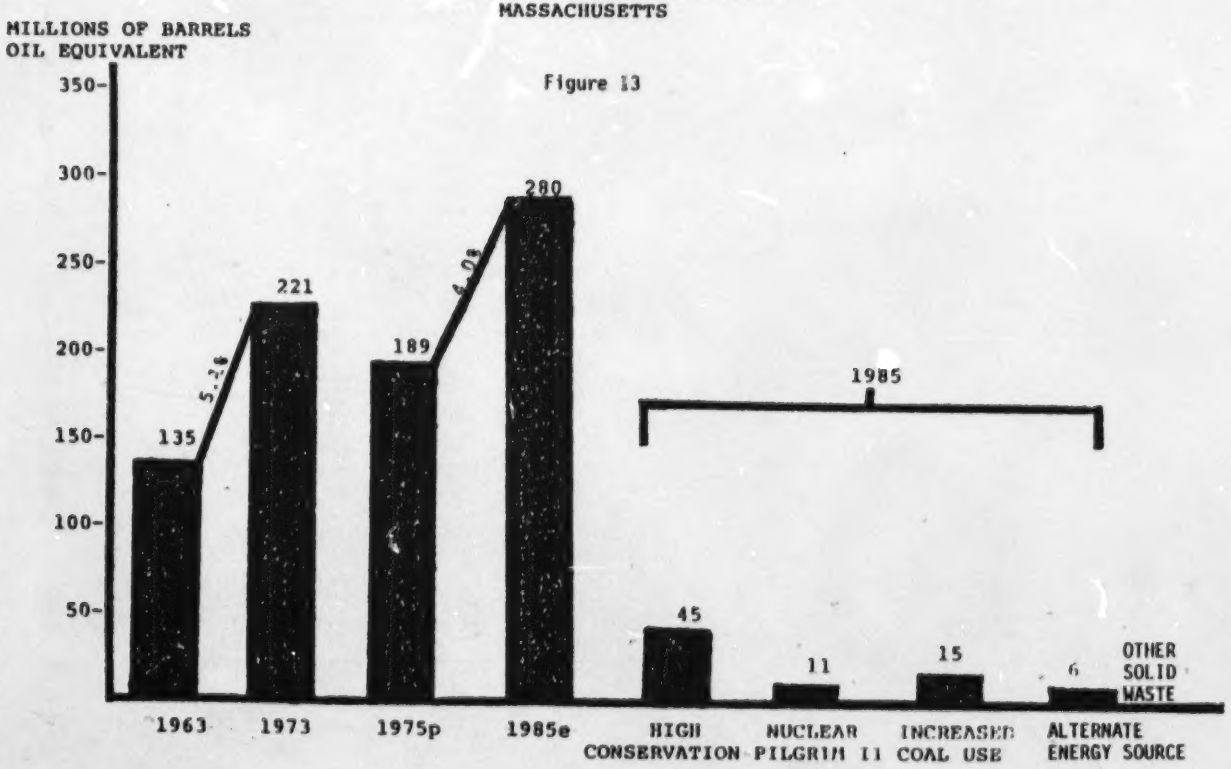
The Energy Facilities Siting Council is composed of four cabinet secretaries and five governor-appointed citizens. It was established in 1974 to work with state agencies, energy companies, and citizens to ensure an adequate, reliable, economical energy supply for Massachusetts with as little damage to the environment as possible. The Council reviews questions of need and choice of sites for gas and electric facilities and major oil facilities.

The Division of Standards, Executive Office of Consumer Affairs, is responsible for fuel allocation.

The Boston Energy Office (BEO) is a quasi-official agency brought about by direct cooperation between government agencies and the academic community. BEO is a joint project of the Mayor's Energy and Utilities Task Force and the New England Consortium on Environmental Protection (an association of 14 colleges and universities). BEO works out of the Boston Conumers' Council and is supervised by MIT faculty. The Office is totally student-staffed; it is involved in innovative projects to address energy issues which affect Boston. Completed projects include in-depth analyses of energy conservation in public schools, an inventory and monitoring system of the City of Boston energy consumption and costs, a solar feasibility study for New England, and assistance to city agencies.

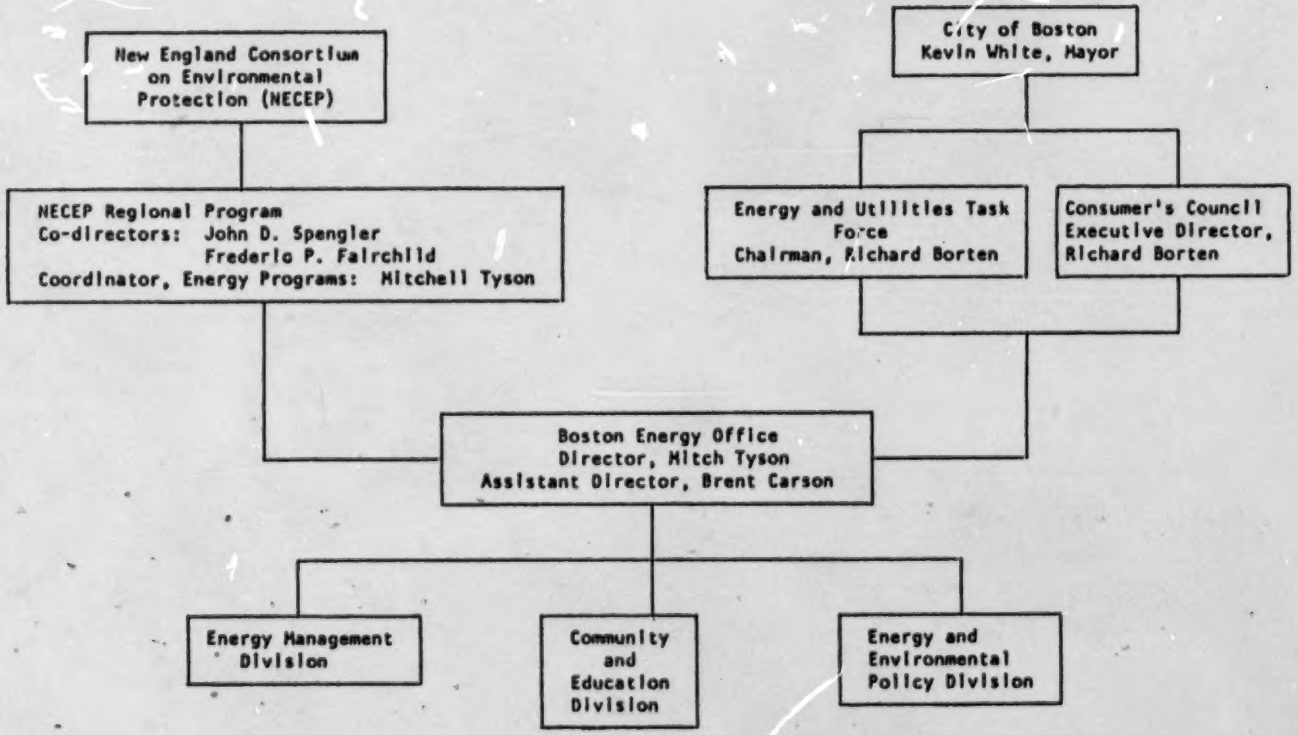
OIL USE AND POTENTIAL SAVINGS
MASSACHUSETTS

Figure 13



BEO Organization

Figure 14



Selected Post Secondary Institutions With Formal Environmental Energy Programs

There are several colleges and universities in Massachusetts which offer programs in environmental science and pollution control technology. Information on these programs was gathered from college catalogues selected on the basis of recommendations by professionals in the field, and phone calls to department heads. Only a small percentage of the schools in the state were included in our sample; thus, the programs outlined in this section simply represent the kinds of pollution control training available in the state at the two year, four year, and post graduate college levels. These programs are designed to prepare students for technical or professional positions in pollution control and related areas.

Included in this section is Harvard University, which offers a master's degree program in Environmental Health Science, and a program in Environmental Sciences and Engineering leading to the degrees of bachelor of arts, bachelor of science, master of science, and doctor of philosophy, with options in various environmental specialties. Worcester Polytechnic Institute offers a program in Civil Engineering with Sanitary Engineering and Water Resources emphasis, leading to the degrees of bachelor of science, master of science, and doctor of philosophy, as well as a program in Urban and Environmental Planning leading to a bachelor of science degree.

SENIOR INSTITUTIONS

Harvard University
Cambridge, Massachusetts

Program: Environmental Health Science (M.S.)

Hours required for major: Semester - (1 year M.S.) 40, (2 year M.S.) 80
Program Inception: 1913
Staff Size: Not available due to the interdisciplinary nature of the program
Enrollment: 38
Graduates (1976): 14
Placement: not available
Graduate Work: not available

Courses

Principles of Environmental Health
Community Environmental Health Management - A Computerized Game
Principles of Aerospace Health and Safety
Human Factors in Occupational Performance and Safety
Occupational Medical Clinics
Policy Issues in Occupational Health
Mathematical Modeling for Health Sciences
Field Work
Departmental Seminar
Basic Problems in Occupational Health and Industrial Environments
Environmental Control
Aerosol Technology
Community Air Pollution
Meteorological Aspects of Air Pollution
Identification and Measurement of Air Contaminants
Air and Gas Cleaning
Introduction to Radiation Protection
Radiation Protection Engineering
Problems in Radiation Dosimetry
X-ray Protection
Introduction to Physics of Diagnostic Radiology
Introduction to Physics of Nuclear Medicine
Introduction to Physics of Radiation Therapy
Physics of Diagnostic Radiology
Physics of Nuclear Medicine
Physics of Radiation Therapy
Tutorial Programs
Research

Program: Environmental Sciences and Engineering (A.B., S.B., S.M., Ph.D) with options available in Water Resource Engineering, Sanitary Chemistry and Biology, Industrial Hygiene Engineering, Urban Planning for Environmental Health, and Environmental Engineering.

Hours required for major: Individually specified degree requirements
Program Inception: 1951
Staff Size: Ten professors (8 Ph.D., 1 M.D., 1 M.S.)
Enrollment: (A.B., S.B.) not available, (S.M.) 3 (Ph.D.) 20
Graduates (1976): (A.B.) 6, (S.B.) 16, (S.M.) 5, (Ph.D.) 3
Placement: (A.B., S.B.) not available, (S.M., Ph.D.) all
Graduate Work: not available

Courses (Selected)

Design of Water Resource Systems I, II
Water Resources Design Practice
Stochastic Process in Environmental Engineering
Mathematical Programming for Large Systems
Seminar: Models for Environmental Systems Planning
Engineering Systems for Environmental Control
Water Quality and Its Management
Water Pollution Microbiology
Chemical Models of Natural and Polluted Waters
Treatment of Water Supplies and Wastewaters
Surface Phenomena
Rate Processes
Electrochemistry
Environmental Control
Basic Problems in Occupational Health and Industrial Environments
Identification and Measurement of Air Contaminants
Community Air Pollution
Aerosol Technology
Radiation Protection Engineering
Introduction to Radiation Protection
Air and Gas Cleaning
Identification and Estimation
Control and System Theory
Operations Research
Elasticity and Shell Theory
Fluid Mechanics and Elasticity
Statistical Mechanics, Kinetic Theory
Fluid Mechanics and Thermodynamics
Elasticity and Plasticity
Heat Transfer
Elasticity
Fluid Mechanics, Vibrations and Control Systems
Systems, Stability, Electrical Networks
Bio-Mechanics

Aquatic Chemistry
Urban and Regional Systems Analysis
Sanitary Chemistry
Environmental Biology
Water Resource Engineering
Industrial Hygiene
Air Conditioning
Industrial Ventilation and Air Pollution Control
Numerical Analysis and Engineering Design
Environmental Engineering

SENIOR INSTITUTIONS

Worcester Polytechnic Institute
Worcester, Massachusetts

Program: Civil Engineering with Sanitary Engineering and Water Resources Emphasis (B.S., M.S., Ph.D.)

Hours required for major: Semester - (B.S.) 48 courses plus qualifying examination, (M.S.) 30 credits, and (Ph.D.) 60 credits posts Master's Degree.
Program Inception: 1967
Staff Size: One professor, two associate professors, two assistant professors (4 Ph.D., 1 M.S.) plus support from the Life Science faculty.
Enrollment: (B.S.) 100, (M.S.) 5, (Ph.D.) 0
Graduates (1976): (B.S.) 18, (M.S.) 4, (Ph.D.) 0
Placement: information not currently available
Graduate Work (M.S.): 4

Courses

Ground Water Hydrology
Water Treatment for Domestic and Industrial Uses
Wastewater Treatment
Sanitary Engineering Laboratory
Haydraulics of Water Supply and Sewerage Systems
Surface Water Hydrology
Water and Wastewater Treatment Plant Design
Stream, Lake, and Estuarine Analysis
Systems Analysis in Water Resources Management
Fluid Mechanics
Introduction to Oceanography
Humanity and Environment
Introduction to Environmental Problems
Geology
Ecology
Environmental Impact of Energy Systems
Economic Analysis of Urban Problems
Environmental Economics
Physical Climatology
Design of Urban Components
Conservation of Land Resources
Geochemistry
Mircobiology

Program: Urban and Environmental Planning (B.S.)

Hours required for major: Semester - 48 courses plus qualifying examination.

Program Inception: 1977
Staff Size: not available due to the interdisciplinary nature of the program.
Enrollment: 50
Graduates (1976): 0
Placement: 0
Graduate Work: 0

Courses

Urban Societal Systems and Technology
Industrialized Housing Systems
Introduction to City Planning
Design of Urban Components
Planning for Community Facilities
Conservation of Land Resources
Housing and Urban Renewal
Urban Planning Implementation

State Legislation

TITLE:

Environmental Cause of Action Law
Massachusetts Laws 214

PURPOSE:

To provide a system of citizen action and enforcement to protect the environment of the state.

DEFINITIONS:

1. Damage to the environment 2. Person

ADMINISTERING AUTHORITY:

Citizens of the State

AUTHORIZATIONS:

For ten or more citizens to bring civil action to prevent damage to the environment;
To attempt to bring state agency enforcement of environmental laws.

MASSACHUSETTS GENERAL

TITLE:

Environmental Protection Law
Massachusetts Law 12

PURPOSE:

To coordinate the environmental policies of state agencies and to create a division of environmental protection within the department of attorney general.

DEFINITIONS:

1. Damage to the environment

ADMINISTERING AUTHORITY:

Division of Environmental Protection
All State Agencies

AUTHORIZATIONS:

To bring actions to prevent or remedy damage to the environment;
To investigate administration of environmental statutes;
To review and evaluate environmental impact of all projects;
To prepare environmental impact reports (EIRs) for actions and projects;
To issue regulations and guidelines appropriate to EIRs.

MASSACHUSETTS AIR

TITLE:

Air Pollution Control Laws
Massachusetts Laws 111

PURPOSE:

To provide a program of air pollution prevention and abatement in order to protect the public health and welfare in the state.

DEFINITIONS:

ADMINISTERING AUTHORITY:

Department of Public Health
Bureau of Air Quality Control

AUTHORIZATIONS:

To issue regulations pursuant to the act;
To declare air pollution emergencies;
To generally regulate atmospheric pollution and air quality;
To conduct a continuing inventory of air pollution source emissions;
To generally enforce all provisions of the act.

PROHIBITED ACTS:

To violate any regulations issued pursuant to the act;
To renew or render inoperative motor vehicle air pollution control devices;
To violate other act provisions or emergency orders.

PENALTIES:

Initial offense - fines of from $50 to $100;
Subsequent offenses - fines of at least $200.

MASSACHUSETTS PESTICIDES

TITLE:

Pesticide Law
Massachusetts Laws 94B

PURPOSE:

To provide a program of pesticide applicator certification to improve pesticide use and safety.

DEFINITIONS:

1. Application of pesticides
2. Board
3. Disposal
4. Farmer
5. Land of another
6. Operational license
7. Pesticide
8. Supervisory license
9. Surface waters and tributaries used for public water supply
10. Watershed of public water supply

ADMINISTERING AUTHORITY:

Department of Public Health
Pesticide Board

AUTHORIZATIONS:

To issue regulations pursuant to the act;
To classify pesticides and restrict their usage;
To enter and inspect property in enforcement of the act;
To license pesticide dealers;
To certify private and commercial applicators.

CERTIFICATION OR LICENSING:

All applicators of pesticides on land of another must be licensed; operational and supervisory categories established.

PROHIBITED ACTS:

To apply pesticides to land of another without license;
To violate other act provisions or regulations.

EXEMPTIONS:

Farmers not required to be licensed, but permits may be required.

PENALTIES:

Violation of act - fines of up to $500 or two months imprisonment;
Violation of regulations - fines of up to $100 for initial offense and up to $500 for subsequent offenses.

MASSACHUSETTS RADIATION

TITLE:

Radiation Protection Laws
Massachusetts Laws - Portions of Ch. 111

PURPOSE:

To protect the public from radiation hazards and regulate certain sources of ionizing radiation.

DEFINITIONS:

1. Board of health
2. Commissioner
3. Council
4. Department

ADMINISTERING AUTHORITY:

Department of Public Health
Advisory Council on Radiation Protection

AUTHORIZATIONS:

To make recommendations concerning ionizing radiation sources;
To require registration of ionizing radiation sources;
To issue regulations pursuant to the act.

PROHIBITED ACTS:

To maintain or operate a fluoroscopic shoe-fitting device;
To violate other act regulations.

EXEMPTIONS:

Diagnostic, thereaputic and experimental uses.

PENALTIES:

Fines of from $10 to $50.

NRC AGREEMENT STATE: No

MASSACHUSETTS SOLID WASTE

TITLE:

Solid Waste Disposal Act
Massachusetts Laws 16-18

PURPOSE:

To provide for a program of solid waste disposal regulation at the state and local levels.

DEFINITIONS:

1. Solid waste
2. Solid waste disposal facility

ADMINISTERING AUTHORITY:

Department of Public Health
Bureau of Solid Waste Disposal

AUTHORIZATIONS:

To purchase, lease and maintain solid waste disposal facilities;
To make recommendations on solid waste disposal and safety;
To conduct research relating to solid waste disposal and recycling;
To issue regulations pursuant to the act;
To develop a comprehensive solid waste plan;
To supervise the local control and disposal of solid wastes.

MASSACHUSETTS WASTE WATER

TITLE:

Board of Certification of Operators Law
Massachusetts Laws 13-66A

PURPOSE:

To provide a program of certification for operators of waste water treatment facilities and drinking water supply facilities.

DEFINITIONS:

ADMINISTERING AUTHORITY:

Board of Certification of Operators of Waste Water Treatment Facilities
Board of Certification of Operators of Drinking Water Supply Facilities

AUTHORIZATIONS:

To conduct examination for facility operators;
To issue certificates to facility operators;
To take such other actions as necessary to carry out the act.

CERTIFICATION OR LICENSING:

All drinking water and waste water facility operators must be certified; provision made for prior operators.

PROHIBITED ACTS:

To fail to have certified operator in supervision of facilities;
To violate other act provisions.

PENALTIES:

Fines of up to $20 per day.

MASSACHUSETTS WASTE WATER

TITLE:

Clean Water Act
Massachusetts Laws 21-26

PURPOSE:

To enhance the quality and value of water resources of the state, and to establish a program of prevention, control and abatement of water pollution.

DEFINITIONS:

1. Director
2. Effluent limitation
3. Person
4. Pollutant
5. Treatment works
6. Waters

ADMINISTERING AUTHORITY:

Department of Natural Resources
Division of Water Pollution Control

AUTHORIZATIONS:

To encourage the prevention and abatement of water pollution;
To act as the state lead agency in water pollution matters;
To conduct studies relating to water pollution;
To adopt water quality standards and effluent limitations;
To develop a state water pollution control plan;
To issue regulations pursuant to the act;
To approve disposal facility construction;
To supervise oil spill cleanup operations.

PROHIBITED ACTS:

To discharge pollutants into waters of the state in violation of permit;
To fail to obtain a permit for disposal system construction;
To dispose of waste oil into waters of the state without permit;
To dispose of hazardous waste without a license;
To violate other act provisions or regulations relating to water pollution.

PENALTIES:

Criminal - fines of from $2,500 to $25,000 or one year imprisonment;
Civil - fines of up to $10,000 per day;
Liability also imposed for all oil spill cleanup expenses.